chrysanthos®

COLOR COMPANY LIMITED

Ceramic
Information Manual

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1. INTRODUCTION

Welcome to the Chrysanthos Color Company Limited Ceramic Information Manual. In this manual you will find detailed information on the use of our products as well as any safety considerations.

The products discussed in this manual were first developed for use in ceramics however the acrylic products have application in other arts and craft areas due to their versatility.

We hope this manual will provide you with answers to questions about our products; however more information may be obtained by contacting us directly or via our web site: www.chrysanthos.com

2. GENERAL INFORMATION

2.1. PRODUCT RANGE AND QUALITY

Chrysanthos produces an extensive range of products for use in ceramics and other art and craft areas.

All products have been thoroughly researched and tested resulting in very user-friendly products.

Quality control practices in place ensure consistency and reliability. Every bottle that leaves the factory performs identical to others before it, meaning predictable results when used according to directions or proven techniques.

2.2. PRODUCT PACKAGING AND LABELLING

All products are packaged in clearly labelled environmentally friendly non toxic recyclable plastic containers. Our labels have the distinctive Chrysanthos logo to one side. Each product label shows:

- The product group, product code, product name and size.
- GHS or ASTM regulated Hazards Identification and safe handling information.
- Directions for use.
- Fired temperature range or whether a non-fired product.
- Transparency for glazes.
- Batch Number.
- Chrysanthos contact details or Importer/Distributor contact details.

The labels may use the GHS Standard for labelling of chemical materials or LHAMA ASTM depending on the specific market requirements. It is important that labels are read, before any product is used. For commercial users, it is recommended that testing take place before committing to use the products on commercial work.

Language is another feature of the Chrysanthos labels. To satisfy specific market requirements, the hazards and directions on labels may be custom made for any language. Currently labels are produced in English, Mandarin, Spanish, Italian, Hebrew, Japanese, German, French, Russian and Czech.

The Chrysanthos products are available in a broad range of container sizes (from 30 millilitres to 10 Litres). For convenience the smaller containers are typically squeezable plastic and come with a flip-top, whereas the larger containers are rigid plastic and have a broad neck to accommodate a brush.

2.3. PREPARATION AND APPLICATION

Before usage, all products should be stirred or shaken thoroughly to disperse the contents, resulting in even and consistent application.

In the case of ceramic ware (greenware or bisqueware) care should be taken to ensure it is dust free. Use a slightly damp sponge to remove any dust or marks and in the case of greenware, the sponge can be used to remove any unwanted ridges.

When working with ceramic ware, it is important that hands are clean, as grease or cream on hands will transfer to the ceramic ware and cause application problems.

The transfer of images to bisqueware with carbon paper is not recommended as the grease on the paper will prevent the glaze from adhering to the ware. A HB pencil can be used to copy designs by free hand onto ware. Mistakes should only be corrected with the assistance of a damp cloth to remove unwanted lines. Using erasers is not recommended as the glaze tends to not adhere where the eraser has been used.

Brushes that are being used to decorate must be cleaned between colors and products to prevent cross contamination, particularly if they are being used directly from the container. The fired piece will also be free of imperfections caused by this type of problem.

As with ceramic ware, the surface of all other areas to be decorated should be clean to ensure that the colors adhere to the surface properly. However many of the restrictions that apply to ceramic ware do not apply to the other surfaces.

2.4. PRODUCT COMPATIBILITY

Most of the Chrysanthos products may be intermixed with their own product group to achieve predictable results i.e., Underglazes with Underglazes etc and in many cases across product groups i.e. Underglazes with One Strokes etc.

With fired products, in most cases the result may be predictable however in some cases it may not; therefore it is recommended that small trials be run of any mixed colors and glazes etc to confirm results.

The mixing of food-safe glazes/products with those that are not food-safe glazes/products implies the resultant glaze is not food-safe. The mixing of two food safe glazes may also yield a product that is not food safe, so mixing of products should be done with care and some prior knowledge of ceramics as well as appropriate testing to confirm safety is advantageous.

Mixing of acrylic products with glaze products is not possible.

2.5. CLEANUP AND STORAGE

Virtually all Chrysanthos products are water based therefore brushes etc, should be cleaned with water.

Products should always be stored in a cool dry place away from direct sunlight to maximise the shelf life. During use, care should be taken not to contaminate the contents and any remainder properly sealed to preserve the contents.

Product that has been decanted onto a palate should never be returned to the bottle for storage to prevent contamination.

After clean up, hands should also be washed and with soap and water.

2.6. SAFETY INFORMATION

Most of the Chrysanthos products are non-toxic when used with care. The glaze products consist of a range of ingredients including clays, oxides [1], fritted compounds, rheology modifiers, preservative and water.

During firing, the glaze products release a number of gaseous compounds, mainly water, carbon dioxide, and traces of other organic and inorganic compounds.

The acrylic products consist mainly of acrylic co-polymers[2], clays, organic pigments, rheology modifiers and water.

Many of the products may be airbrushed. When doing so, a proper facemask should be worn and airbrushing should take place in a spray booth equipped with an exhaust fan in order to avoid inhalation of air-borne particles. This practice is essential if chronic long-term side effects are to be avoided.

Eating and drinking at any time while working with ceramic materials may constitute a health hazard and is not recommended. Modern day contemporary studios have a different approach to ceramics and permit the consumption of food and drink in studios. Again, care should be taken to prevent health issues.

As per normal practice, keep the kiln area well ventilated and avoid inhaling fumes that are produced while firing.

All ware intended for use with food must be glazed with certified food safe glaze and must be fired correctly according to the instructions. The glaze when fired must not be prone to crazing or peeling in order to preserve the integrity of the ceramic ware. Ceramic ware that does not meet this requirement cannot be considered food safe and therefore should not be used for this purpose.

Leaded glazes should not be used by pregnant women. In general, the consumption of food or drink whilst using leaded glazes is not recommended.

Products are labelled according to the GHS (Global Harmonised System) or LHAMA ASTM Standard depending on the market specific requirements.

In the GHS, there are Signal Words and Symbols used to warn users of any acute, chronic or environmental impact issues with products.

The Signal Words are “WARNING” and “DANGER”.

The symbols used singularly or in combination depend on the concentration of the any hazardous components present in the product. Below are the symbols used.

[1] An oxide refers to a pigment used for coloring a glaze.
[2] Co-polymers refer to a mixture of polymers.

				
Acute Toxicity	Corrosive	Environmental Hazard	Explosive	Flammable
				
Health Hazard	Oxidant	Pressurised Gas	Severe Health Hazard	

In ASTM, the key words are:

HARMFUL & NON TOXIC

There are no specific symbols recommend by LHAMA other than an indication of wording require do labels.

Safety Data Sheets (SDS) are available on request for all products, or the SDS maybe downloaded from the Chrysanthos web site. GHS and ASTM SDS are combined.

2.7. DISCLAIMER

This manual may be updated from time to time with additional or corrected information. It is the user's responsibility to ensure that they are using the latest information.

Tips and techniques documented in this manual should be tried experimentally before commitment. This is the user's responsibility and no claims will be entered into for losses or damages resulting from untried or unproven techniques.

3. FIRED PRODUCTS

3.1. UNDERGLAZES

3.1.1. USAGE

Chrysanthos Underglazes come in a large range of colors. When applied correctly to greenware or bisqueware they provide full opaque streak free coverage:

- On greenware, the clay is fired to bisque temperatures then covered with a suitable clear glaze and refired to seal the ceramic piece.

- On bisqueware, the Underglaze decoration should be thoroughly dry before being glazed over and then fired to recommended gloss temperatures to seal the ceramic piece.

- Most of the underglazes may be left unglazed to create a matt look similar to engobes. If fired higher on an appropriate clay body, the result may be slightly satin in appearance. If used in this way, they are mainly suitable for use on non functional ware.

3.1.2. APPLICATION

If color is being brushed on, an appropriate size soft-bristled brush should be used. If a larger area is being covered, a generous sized brush will minimise streakiness and allow a most even application.

To obtain optimum results, 2 - 3 coats of Underglaze should be applied using a well-loaded brush. Ensure each coat is dry before applying subsequent coats at right angles to one another (i.e. crosshatching).

Underglaze colors are designed for use directly from the bottle, although they may be sprayed or sponged. Clean water may be added to achieve alternate finishes or to adjust consistency for spraying.

Note: If employing the high bisque/low gloss method of firing as is the practice in the hobby industry, application of Underglazes on to bisque and glazing directly over the unfired decoration, (before firing to the lower glost temperatures) may result in a less vibrant color, as the Underglazes will not have been exposed to the higher heat development during bisque firing. However, if your practice is to low bisque/high gloss, then color representation will be the same for both bisque and greenware applications.

3.1.3. PHYSICAL DATA

Chrysanthos Underglazes have a broad recommended firing range and most will fire between cone 06 (999^{o}C) and cone 10 (1,305^{o}C).

3.2. ONE STROKES

3.2.1. USAGE

One Stroke colors are intensely pigmented translucent underglazes, designed for painterly decoration and fine detailing. One Strokes offer an efficient means of color application on both greenware and bisqueware:

- On greenware, the clay is fired to bisque temperatures then covered with a suitable clear glaze and refired to seal the ceramic piece.
- On bisqueware, the One Stroke decoration should be thoroughly dry before glazing over and firing to recommended gloss temperatures to seal the ceramic piece.

One Stroke can also be applied directly onto an unfired opaque white glaze surface, then fired in order to achieve a majolica effect.

3.2.2. APPLICATION

One Strokes are formulated to be brushed straight from the bottle, but they may be thinned with a little clean water if color appears too thick or if a more subtle effect is desired for shading or majolica application. Thinning with clean water may also be required when airbrushing.

One Strokes are also suitable for sponging and stippling, and whilst essentially translucent, the intensity of the pigment means that some colors (particularly dark colors) will give excellent solid coverage with a single generous coat.

One Strokes due to their intensity are also useful in coloring slip for engobe application and for tinting White 3D Trailing Glaze.

One Strokes may also be layered over each other and can be used to achieve an opaque underglaze like coverage by application of 2 - 3 coats.

3.2.3. PHYSICAL DATA

Chrysanthos One Strokes have a broad recommended firing range and most will fire between cone 06 (999^{o}C) and cone 10 to (1,305^{o}C).

3.3. SUPERIOR GLAZES

3.3.1. USAGE

Chrysanthos Superior Glazes add color and gloss to ceramic ware in a single step. A large range of colors are available, they are all lead-free and depending on the color are translucent, semi-opaque or opaque in their coverage. They provide a beautiful and practical means of giving solid color coverage to broad areas or for highlighting decorative or incised ware.

Superior Glazes are for application to earthenware bisque and when fired correctly will seal and protect the ceramic ware from moisture and discoloration caused by contact with food and liquids.

3.3.2. APPLICATION

Depending on the firing temperature two or three full coats required to achieve the best results. These are carefully applied at right angles to one another (ie. crosshatched), allowing each to dry in-between. A soft glazing brush should be used in order to minimise streaking. Besides brushing, Superior Glazes may also be sponged.

Superior Glazes are suitable for use in controlled glaze effects, for majolica techniques and are overglaze compatible.

Superior Glazes may be sprayed and thinned with clean water if necessary to improve glaze flow.

3.3.3. PHYSICAL DATA

Chrysanthos Superior Glaze codes are suffixed by an opacity indicator "O" for opaque; "S" for semi-transparent and "T" for transparent.

Superior Glazes may be intermixed however it is not advised to mix Superior Glazes with Hobby Leaded Glaze as they are incompatible and the result will not be food-safe.

Superior Glazes are specifically formulated for application onto low fire earthenware clay that has been bisque fired between cone 04 (1,060^{o}C) and cone 03 (1,101^{o}C) then gloss fired to between cone 07 (984^{o}C) and cone 03 (1,101^{o}C).

3.4. CAFÉ COLORS

3.4.1. USAGE

Chrysanthos Café Colors come in two versions. The standard version which are satin in appearance when left undipped and the gloss version that are glossy when left undipped. The Cafe Colors are for decoration on bisqueware that may be dipped in Clear Superior Glaze or Clear Hobby Glaze. The colors are intense and may be used for detailed design work or as a cover coat.

Whether the standard version or the glass version is used depends on whether pieces will be dipped. If it is dipped, the end result will be identical irrespective of which Cafe Color is used. If the piece is not dipped, then the Cafe Colors will be either satin or gloss in appearance depending on which are used.

The gloss version of the Cafe Colors appear the same as the dip glazed standard version. They also have the same name and product code as the standard version with a suffix of "G" on the code to distinguish them from the standard Cafe Colors.

3.4.2. APPLICATION

Café Colors are applied with an appropriate sized soft-bristled brush for detailed work. If a larger area is being covered, a generous sized brush will minimise streakiness and allow a most even application. Café Colors are also suitable for sponging and stippling.

Café Colors in a single coat application are essentially transparent; however opacity may be achieved by the application of 2 or 3 generous coats, in a cross-hatch manner.

Café Colors are designed for use directly from the bottle, although they may be sprayed or sponged. Clean water may be added to achieve alternate finishes or to adjust consistency for spraying.

3.4.3. PHYSICAL DATA

Café Colors may be intermixed to achieve new colors.

Café Colors are specifically formulated for application onto earthenware clay that has been bisque fired to between cone 04 (1,060^{o}C) and cone 03 (1,101^{o}C), then gloss fired to between cone 06 (999^{o}C) and cone 04 (1,060^{o}C).

Chrysanthos Café Colors have a broad recommended firing range between cone 06 (999^{o}C) and cone 04 (1,060^{o}C).

3.5. FANTASY CRYSTALS

3.5.1. USAGE

Chrysanthos Fantasy Crystals are a premium range of crystal that can be added to the Superior Glazes or to any of the Chrysanthos glaze products.

Care should be taken when handling crystals that they are used in a well ventilated area and are mixed in thoroughly with the glaze before use.

The availability of the Fantasy Crystals enables the creation of an infinite number of combinations of crystal glazes using the Superior Glaze and Fantasy Enhancer as a base.

Please note that the Fantasy Crystals and any crystal glazes made using these products are not suitable for functional ware due to the tendency of the crystals to craze.

3.5.2. APPLICATION

The Fantasy Crystals may be applied to the surface of bisqueware either by placing them on wet glaze by hand or by mixing them into the glaze to be applied.

An interesting effect can be obtained by adding Fantasy Enhancer to a Superior Glaze that is first applied to bisqueware. The crystals can be mixed into a contrasting color Superior Glaze and then applied over the first glaze.

3.5.3. PHYSICAL DATA

For the best results, the Fantasy Crystals along with the glaze should be fired to between cone 06 (999^{o}C) and cone 04 (1,060^{o}C) on earthenware bisque that has been previously fired to between cone 04 (1,060^{o}C) and cone 03 (1,101^{o}C).

3.5.4. SAFETY DATA

Ceramic ware that has been coated with Fantasy Crystals should not be used for the storage of food and beverages.

The Fantasy Crystals are lead free however they may have a tendency to craze.

3.6. CRYSTALLITES

3.6.1. USAGE

Chrysanthos Crystallite are lead-free and come in a range of decorative matt finishes highlighted by a spattering of tiny glass flecks, giving a slightly textured surface finish.

3.6.2. APPLICATION

Before use, mix glaze well, stirring or shaking to distribute crystals evenly.

To obtain optimum results, 3 coats of Crystallite Glazes should be applied using a well-loaded glaze brush. Ensure each coat is dry before applying subsequent coats at right angles to one another (i.e. crosshatching). Alternately 3 coats may be applied with a sponge.

Crystallite Glazes are typically not glazed over.

3.6.3. PHYSICAL DATA

The Crystallite Glazes should be fired between cone 06 (999^{o}C) and cone 04 (1,060^{o}C). If the Crystallite Glazes are fired higher, the color heightens and the crystals further expand.

3.6.4. SAFETY DATA

These products are unsuitable for use on food or beverage containers since the finished product remains unglazed and consequently porous.

3.7. 3D TRAILING GLAZES

3.7.1. USAGE

Chrysanthos 3D Trailing Glazes are a lead-free thick textured trail-able glaze designed for creating raised linear decoration. They can be used on both greenware and bisque, in conjunction with underglaze decoration, or on top of unfired glaze. They can be left unglazed, or may be coated with colored or clear glaze.

Chrysanthos 3D Trailing Glazes achieve stability and versatility, without cracking and come in a convenient nozzle squeeze bottle.

To create more colors than those available, colors may be intermixed. This is achieved by squeezing colors to be mixed into a pallet and mixing with a clean brush or pallet knife. The mixed color is then scooped back into a clean applicator bottle.

3.7.2. APPLICATION

Shake the applicator bottle well and always test on paper to ensure 3D Trailing Glaze flows correctly before attempting to decorate ware.

If glaze appears too thick, add a few drops of clean water and shake to combine thoroughly.

If applicator nozzle is blocked, remove and wash in hot water using paper clip wire to dislodge blockage. Dry nozzle before reattaching it to the bottle.

To apply, gently squeeze the bottle with the applicator tip above (and not touching) the ceramic surface. If applying to earthenware bisque, allow slip trail decoration to dry thoroughly before glazing over.

3.7.3. PHYSICAL DATA

Chrysanthos 3D Trailing Glazes may be fired between cone 06 (999^{o}C) and cone 04 (1,060^{o}C) without significant flattening of the raised decoration.

3.8. CRACKLE GLAZES

3.8.1. USAGE

Chrysanthos Crackle Glazes are available as a clear for application over plain earthenware bisque or bisque that has been first decorated with Underglazes, One Strokes or Café Colors. Alternately, they are available as colored crackle glaze that may be applied directly to unpainted earthenware bisque.

3.8.2. APPLICATION

Generally, to obtain optimum results, 2 - 3 coats of crackle glaze should be applied using a well-loaded glaze mop brush. Ensure each coat is dry before applying subsequent coats at right angles to each other.

3.8.3. PHYSICAL DATA

For the best results, the Crackle Glazes should be fired to between cone 06 (999^{o}C) and cone 04 (1,060^{o}C) on earthenware bisque that has been previously fired to between cone 04 (1,060^{o}C) and cone 03 (1,101^{o}C).

3.8.4. SAFETY DATA

Ceramic ware that has been coated with Crackle Glazes should not be used for the storage of food and beverages.

Some of the crackle glazes may also contain copper therefore these have a caution/harmful label.

3.9. FENG SHUI GLAZES

3.9.1. USAGE

Chrysanthos Feng Shui Glazes are a range of glaze varieties aimed more at the sophisticated user. They are a range of glazes that produce more striking results due to their compositions.

3.9.2. APPLICATION

Generally, to obtain optimum results, 2 - 3 coats of Feng Shui Glazes should be applied using a fan brush. Ensure each coat is dry before applying subsequent coats at right angles to each other. In the case of the metallic glazes; 3 – 4 coats may be required to achieve an excellent metallic finish.

3.9.3. PHYSICAL DATA

For the best results, the Feng Shui Glazes should be fired between cone 06 (999^{o}C) and cone 04 (1,060^{o}C) on bisque that has been previously fired to between cone 04 (1,060^{o}C) and cone 03 (1,101^{o}C). In the case of the metallic glazes, the recommended firing range is between cone 05 (1,046^{o}C) and cone 03 (1,101^{o}C).

3.9.4. SAFETY DATA

Refer to label and MSDS concerning safety of a particular glaze for decorating Ceramic ware that is to contain food or beverage.

3.10. LOW SHEEN GLAZES

3.10.1. USAGE

Chrysanthos Low Sheen Glazes are a premium range of satin glazes designed to create a low sheen finish on ceramic ware in an array of captivating colors.

Low Sheen Clear Glaze may be used over Underglaze and One Stroke decoration for a muted effect.

Low Sheen Glazes are for application to earthenware bisque and when fired correctly will seal and protect the ceramic ware from moisture and discolouration caused by contact with food and liquids.

Low Sheen Glazes are also fully intermixable.

3.10.2. APPLICATION

To obtain optimum results, 2 - 3 thin coats of Low Sheen Glaze should be applied using a fan brush. Ensure each coat is dry before applying subsequent coats at right angles to one another (i.e. crosshatching). Water may be added if necessary to thin the glaze to prevent bubbling or other imperfections.

In the case of the Low Sheen Clear, only 2 thin coats should be applied.

The Low Sheen Glazes should be removed from the kiln when they have cooled sufficiently to avoid crazing.

3.10.3. PHYSICAL DATA

For the best results, the Low Sheen Glazes should be fired to between cone 06 (999^{o}C) and cone 04 (1,060^{o}C) on earthenware bisque that has been previously fired to between cone 04 (1,060^{o}C) and cone 03 (1,101^{o}C). A slow firing is preferable to ensure that the glaze has time to smooth out and produce a smooth silky finish.

3.10.4. SAFETY DATA

Ceramic ware that has been coated with Low Sheen Glazes may be used for the storage of food and beverages if the glaze has not crazed.

Always refer to the bottle and MSDS for all hazard and safety instructions.

3.11. FANTASY GLAZES

3.11.1. USAGE

Chrysanthos Fantasy Glazes are a premium range of crystal glaze designed to add an element of surprise to your ceramics experience. The Fantasy Glazes are applied directly to bisque from the container. Colors may be intermixed to create even more exciting combinations than those available.

The Fantasy Enhancer may be added to each of the products to enhance the crystal growth and flow effect of the Fantasy Glazes either individually or in combination.

Fantasy Glazes may be applied adjacent to each other and will not flow into one another so multiple effects can be applied to one piece. To allow them to flow into one another just add Fantasy Enhancer to some or all of the Fantasy Glazes before application.

For a really interesting effect, add Fantasy Enhancer to a Fantasy Glaze that is applied to the top of a piece and let it run down over other Fantasy Glazes.

The Fantasy Glazes are also fully intermixable with the Superior Glazes.

3.11.2. APPLICATION

Generally, to obtain optimum results, 2 - 3 coats of Fantasy Glaze should be applied using a glaze fan brush. Ensure each coat is dry before applying subsequent coats.

Different methods can be used to apply the Fantasy Glaze. Either shake the jar and apply glaze and crystals together or first apply glaze for one or two coats then shake the jar and apply the last coat with crystals.

Use the following as a guide as to how much Fantasy Enhancer may be added to Fantasy Glaze to create the different effects:

Qty of Fantasy Enhancer per 100 ml of Fantasy Glaze	Result
10 ml	Enhanced crystal growth, no increase in flow
20 ml	Enhanced crystal growth and glaze starts to flow a little
30 ml	Glaze and crystals become diffused and glaze runs freely

Note that when Fantasy Glaze is to run, be sure to stilt piece correctly and brush ample Kiln Wash onto shelves to prevent damage to shelves.

3.11.3. PHYSICAL DATA

For the best results, the Fantasy Glazes should be fired to between cone 06 (999^{o}C) and cone 04 (1,060^{o}C) on earthenware bisque that has been previously fired to between cone 04 (1,060^{o}C) and cone 03 (1,101^{o}C).

3.11.4. SAFETY DATA

Ceramic ware that has been coated with Fantasy Glazes should not be used for the storage of food and beverages.

The Fantasy Glazes in all cases are lead free. Several may contain encapsulated cadmium or copper compounds and due to the nature of these types of glazes, they will have a tendency to craze.

Always refer to the bottle for all hazards and safety instructions.

3.12. SPECKLED CAFÉ COLORS

3.12.1. USAGE

Chrysanthos Speckled Café Colors are for decoration on bisqueware that may be dipped in Clear Superior Glaze or Clear Hobby Glaze. The colors can be used in conjunction with the Cafe Colors however if they are to be left undipped, they should be used with the gloss version of the cafe colors depending on the result required.

The colors in the range match up with the Cafe Colors of the same name. To distinguish them from the cafe colos, the code has been prefixed with "SC" followed by the number and the name has been prefixed with a "☆".

3.12.2. APPLICATION

Speckled Café Colors are applied with an appropriate sized soft-bristled brush for detailed work. If a larger area is being covered, a generous sized brush will minimise streakiness and allow a most even application. Speckled Café Colors are also suitable for sponging and stippling.

Speckled Café Colors in a single coat application are essentially transparent; however opacity may be achieved by the application of 2 or 3 generous coats, in a cross-hatch manner.

Spekled Café Colors are designed for use directly from the bottle, although they may be sponged. Clean water may be added to achieve alternate finishes.

3.12.3. PHYSICAL DATA

Speckled Café Colors may be intermixed to achieve new colors.

Speckled Café Colors are specifically formulated for application onto earthenware clay that has been bisque fired to between cone 04 (1,060^{o}C) and cone 03 (1,101^{o}C), then gloss fired to between cone 06 (999^{o}C) and cone 04 (1,060^{o}C).

Chrysanthos Speckled Café Colors have a broad recommended firing range between cone 06 (999^{o}C) and cone 04 (1,060^{o}C).

3.13. ANTIQUE GLAZES

3.13.1. USAGE

Chrysanthos Antique Glazes are a range of glaze varieties aimed more at the sophisticated user. The glazes produce more striking results due to their compositions.

3.13.2. APPLICATION

Generally, to obtain optimum results, 2 - 3 coats of the glazes should be applied using a fully loaded brush. Ensure each coat is dry before applying subsequent coats at right angles to each other.

With variegated glazes, different effects will result based on the thickness of the glaze on the surface of the body, ridges present in the clay body were pooling of glaze can occur, clay body used and firing temperature.

3.13.3. PHYSICAL DATA

Antique Glazes are specifically formulated for application onto earthenware clay that has been bisque fired to between cone 04 (1,060^{o}C) and cone 03 (1,101^{o}C), then gloss fired to between cone 06 (999^{o}C) and cone 04 (1,060^{o}C).

Chrysanthos Antique Glazes have a broad recommended firing range between cone 06 (999^{o}C) and cone 04 (1,060^{o}C).

3.13.4. SAFETY DATA

Chrysanthos Color Co. Ltd. Antique Glazes are food safe when fired correctly.

3.14. HIGH FIRE GLAZES

3.14.1. USAGE

Chrysanthos High Fire Glazes add color and gloss to ceramic ware in a single step. A large range of colors are available, they are all lead-free and depending on the color are translucent, semi-opaque or opaque in their coverage. They provide a beautiful and practical means of giving solid color coverage to broad areas or for highlighting decorative or incised ware.

High Fire Glazes are for application to bisqueware and when fired correctly will seal and protect the ceramic ware from moisture and discoloration caused by contact with food and liquids.

3.14.2. APPLICATION

Three full coats required to achieve the best results. These are carefully applied at right angles to one another (ie. crosshatched), allowing each to dry in-between. A soft glazing brush should be used in order to minimise streaking. Besides brushing, High Fire Glazes may also be sponged.

High Fire Glazes are suitable for use in controlled glaze effects, for majolica techniques and are overglaze compatible.

High Fire Glazes may be sprayed and thinned with clean water if necessary to improve glaze flow.

High Fire Glazes may be sprayed and thinned with clean water if necessary to improve glaze flow.

3.14.3. PHYSICAL DATA

Chrysanthos High Fire Glaze codes are suffixed by an opacity indicator "O" for opaque; "S" for Semi-Transparent and "T" for transparent.

High Fire Glazes may be intermixed.

High Fire Glazes are specifically formulated for application onto mid fire clay that has been bisque fired and then gloss fired to between cone 4 (1,186^{o}C) and cone 6 (1,222^{o}C).

3.15. HIGH FIRE EXOTICS

3.15.1. USAGE

Chrysanthos High Fire Exotics are a range of glaze varieties aimed more at the sophisticated user. The glazes produce more striking results due to their compositions. Within the range are the following groups of products:

a) Metallic Glazes group HE001 – HE005
b) Variegated Glazes group HE101 – HE157
c) Low Sheen Glazes group HE201– HE209
d) Crackle Glazes group HE301
e) Mottled Glazes group H401 - HE421

3.15.2. APPLICATION

Generally, to obtain optimum results, 3 - 4 coats of the metallic glazes and 2 - 3 coats of the other glazes should be applied using a fully loaded brush. Ensure each coat is dry before applying subsequent coats at right angles to each other.

With the variegated and mottled glazes, different effects will result based on the thickness of the glaze on the surface of the body, ridges present in the clay body were pooling of glaze can occur, clay body used and firing temperature.

Custom variegated glazes can be created by mixing oxides and other raw materials with the HE101 Clear.

3.15.3. PHYSICAL DATA

The High Fire Exotics have been specifically formulated for application to mid fire clays that are to be glaze fired to between cone 4 (1,186^{o}C) and cone 6 (1,222^{o}C).

3.15.4. SAFETY DATA

Chrysanthos Color Co. Ltd. High Fire Exotics fall into two categories, from above; group b), c) and e) are food safe when fired correctly while group a) and d) are not food safe.

3.16. RAKU GLAZES

3.16.1. USAGE

Chrysanthos Raku Glazes are a range of glaze varieties aimed more at the sophisticated user who is looking for unpredictable and exciting effects ranging from very matt to glossy variable surface textures. These glazes produce more striking results due to their compositions, the method of firing and then reduction.

3.16.2. APPLICATION

The Raku Glazes are available as a liquid or a powder. For the liquid, generally 2, 3 or 4 coats maybe applied to bisque. For dipping, glaze slurry with an SG of about 1.4 is sufficient. The number of coats applied or the length of time dipped will affect the final result as will the firing and then the eventual reduction in foreign matter like saw dust, leaves etc.

Once applied and dry, the glazed piece maybe fired in either electric or gas kiln. Once the kiln reaches temperature and is off, the kiln is open while red hot and the piece transferred to a metal container with a lid that is lined with organic material, like saw dust, leaves etc. The piece is put in to the container and the lid put on to create the reduction atmosphere.

In the metal container, flames will develop and a lot of smoke will follow. The flames will cease soon after the lid is put on the container and the piece should be allowed to rest there until it cools down.

Once cool, it can removed from the container and should be scraped with a soft metal brush to remove any excess material from the firing then washed in cold water.

3.16.3. PHYSICAL DATA

The Raku Glazes have been specifically formulated for application to bisque fired clays. The Raku Glazes should be fired between cone 013 (854^{o}C) and cone 06 (999^{o}C).

3.16.4. SAFETY DATA

Chrysanthos Color Co. Ltd. Raku Glazes come in two ranges; RG0001 to RG017 are leaded, RG021 to RG033 are unleaded.

Caution should be exercised in using the Raku glazes however as they all have warning labels due to the levels of lead and/or copper or other elements in high enough concentrations exceeding threshold limits to render them harmful.

When working with Raku Glazes, it is important to use personal protection like fire proof gloves, face mask and overalls.

3.17. UNDERGLAZE PENCILS

3.17.1. USAGE

Chrysanthos Underglaze Pencils are lead-free and non toxic and are intended for use on bisque where it is desired to create a fine line or shade. They can also be used for identification or marking test pieces.

3.17.2. APPLICATION

After application of Underglaze Pencil color to bisque, the color should be coated with a clear glaze before firing to the glazes maturing temperature. The first coat of glaze should be sponged on over the Underglaze Pencil design to prevent the design from coming off if a brush on glaze is used. If the glaze is to be sprayed on or dipped on, it is not necessary to sponge any glaze on over the Underglaze Pencil design.

Note that unlike regular pencils—care must be taken in sharpening Underglaze Pencils. Do not use a pencil sharpener. It is best to sharpen them with a knife or blade.

3.17.3. PHYSICAL DATA

Chrysanthos Underglaze Pencils may be fired between cone 06 (999^{o}C) and cone 10 (1,305^{o}C) except for UP005 Brown which can be fire to a maximum of Cone 6 (1,222^{o}C).

3.18. HOBBY GLAZE CLEAR

3.18.1. USAGE

Chrysanthos Color Co. Ltd. Hobby Glazes are specifically formulated for application and firing on white clays used in the hobby ceramic industry. The colored appearance of the Hobby Clear Glaze is intended to assist application by highlighting glazed areas.

When fired correctly, the Hobby Clear Glaze will seal and protect ceramic ware from moisture and discoloration caused by contact with food and liquid. The Hobby Clear Glaze also enhances Underglaze, One Stroke and Café Colors over which it has been applied.

3.18.2. APPLICATION

Any Underglaze, One Stroke or Café Color decoration that has been applied on bisqueware should be dry before being glazed over using Hobby Clear Glaze.

To obtain optimum results, 2 - 3 coats of glaze should be applied using a well-loaded glaze mop brush. Ensure each coat is dry before applying subsequent coats at right angles to one another (i.e. crosshatching).

For glazing the interiors of hollow-ware a "roll glazing" technique is used. The glaze is diluted with 33% clean water to 67% glaze (1:3), poured into the vessel to be glazed and slowly rotated to ensure all interior surfaces are coated before draining.

The remaining diluted glaze may be reserved for future roll glazing application provided it is stored in an air-tight container and properly stirred before re-use.

The interior of vessels should always be glazed before the exterior to avoid over-handling and more importantly to avoid the possibility of damaging the external glaze.

Hobby Glazes are also available in dipping versions. To dip, ensure that any decoration that has been applied to the bisqueware is dry. Stir the glaze thoroughly and to one litre of glaze add 400 – 500 ml clean water. Proceed to dip pieces once using tongs, stirring glaze occasionally to keep the glaze uniform.

Note: The application of lead-bearing glazes by spraying is not recommended.

Due to its high porosity, hobby earthenware intended for the storage of food or beverages should be entirely glazed with Hobby Clear Glaze and stilted for glaze firing, rather than dry footed. This will eliminate the risk of moisture absorption and bacterial growth into the porous earthenware body.

3.18.3. PHYSICAL DATA

The Hobby Glazes should be fired between cone 06 (999^{o}C) cone 04 (1,060^{o}C) to produce a clear glossy finish on bisque that has previously been fired between cone 04 (1,060^{o}C) and cone 03 (1,101^{o}C).

3.18.4. SAFETY DATA

Chrysanthos Color Co. Ltd. Hobby Glazes when used with appropriate precautions are non-toxic however it does contain lead bi-silicate.

Ceramic ware that has been coated with Hobby Clear Glaze, should not be used for the storage of food and beverages if it has crazed or not been fired correctly (cone 06 to 04).

3.19. SUPERIOR GLAZE CLEAR

3.19.1. USAGE

Chrysanthos Superior Clear Glaze is a lead free clear glaze that has been specifically designed as a replacement for Hobby Clear Glaze. The color response as such is very similar to that achieved by using a leaded glaze.

Available in brush on and dipping versions, they can be used on earthenware bisque that has first been decorated with one of Underglazes, One Strokes or Cafe Colors. Once fired correctly, the Superior Clear Glaze will protect the ware from moisture and discoloration caused by contact with food and liquids.

The colored appearance of the brush on Superior Clear Glaze is intended to assist application by highlighting glazed areas.

3.19.1.1. APPLICATION

Depending on the firing temperature two or three full coats are required to achieve the best results using the Superior Clear Glaze Brush on. The coats are carefully applied at right angles to one another (ie. crosshatched), allowing each to dry in-between. A soft glazing brush should be used in order to minimise streaking. Besides brushing, the Superior Clear Glaze may also be sponged.

The Superior Clear Glaze Brush on may be sprayed and thinned with clean water if necessary to improve glaze flow.

When using the Superior Clear Glaze Dipping, it may be necessary to add some clean water depending on the thickness of the glaze required on the ware and the firing temperature of the kiln. Stir the glaze thoroughly and to 10 litres of glaze add 400 – 500 ml clean water. Proceed to dip pieces once using tongs, stirring glaze occasionally to keep the glaze uniform.

Both the Brush on and the Dipping Glaze are overglaze compatible.

3.19.2. PHYSICAL DATA

The Superior Clear Glaze has been specifically formulated for low fire earthenware clay that has been earthenware bisque fired between cone 04 (1,060^{o}C) and cone 03 (1,101^{o}C) then gloss fired to between cone 07 (984^{o}C) and cone 03 (1,101^{o}C).

3.20. LOW SHEEN GLAZE CLEAR

3.20.1. USAGE

Chrysanthos Low Sheen Clear Glaze is a satin/matt lead free glaze designed for use over items that have been first decorated with underglazes and one strokes. Once fired correctly the ware will exhibit a beautiful low sheen finish and will be protected from moisture and discoloration caused by contact with food and liquids.

The colored appearance of the Low Sheen Glaze is intended to assist application by highlighting glazed areas.

3.20.1.1. APPLICATION

Two thin coats are required to achieve the best results using the Low Sheen Clear Glaze. These are carefully applied at right angles to one another (ie. crosshatched), allowing each to dry in-between. A soft glazing brush should be used in order to minimise streaking.

The Low Sheen Clear Glaze Brush On may be sprayed and thinned with clean water if necessary to improve glaze flow.

When using the Low Sheen Clear Glaze Dipping, it may be necessary to add some clean water depending on the thickness of the glaze required on the ware and the firing temperature of the kiln. Stir the glaze thoroughly before use. Proceed to dip pieces once using tongs, stirring glaze occasionally to keep the glaze uniform.

3.20.2. PHYSICAL DATA

The Low Sheen Clear Glazes have been specifically formulated for application to earthenware clays that are to be glaze fired to between cone 06 (999^{o}C) and cone 04 (1,060^{o}C).

3.21. HIGH FIRE GLAZE CLEAR

3.21.1. USAGE

Chrysanthos High Fire Clear Glaze is a high gloss lead free glaze designed for use over items that have been first decorated with underglazes and one strokes. Once fired correctly the ware will be protected from moisture and discoloration caused by contact with food and liquids.

The colored appearance of the brush on High Fire Clear Glaze is intended to assist application by highlighting glazed areas.

3.21.1.1. APPLICATION

Three full coats are required to achieve the best results using the High Fire Clear Glaze. These are carefully applied at right angles to one another (ie. crosshatched), allowing each to dry in-between. A soft glazing brush should be used in order to minimise streaking. Besides brushing, the High Fire Clear glaze may also be sponged.

The High Fire Clear Glaze Brush on may be sprayed and thinned with clean water if necessary to improve glaze flow.

When using the High Fire Clear Glaze Dipping, it may be necessary to add some clean water depending on the thickness of the glaze required on the ware and the firing temperature of the kiln. Stir the glaze thoroughly and to 10 litres of glaze add 400 – 500 ml clean water. Proceed to dip pieces once using tongs, stirring glaze occasionally to keep the glaze uniform.

Both the High Fire Clear Brush On and the Dipping Glazes are overglaze compatible and may also be sprayed.

3.21.2. PHYSICAL DATA

The High Fire Clear Glazes have been specifically formulated for application to mid fire clays that are to be glaze fired to between cone 4 (1,186^{o}C) and cone 6 (1,222^{o}C).

3.22. FANTASY ENHANCER

3.22.1. USAGE

Chrysanthos Fantasy Enhancer is a lead free glaze additive that may be added to the Fantasy Glazes or glazes made with the addition of Fantasy Crystals to enhance crystal formation and promote glaze flow.

The Fantasy Enhancer is added at the rate of 10 ml per 100 mls of glaze to enhance crystal growth. Amounts of Fantasy Enhancer over 30 ml per 100 mls of glaze will cause glaze flow.

The Fantasy Enhancer allows ceramists to explore interesting glaze effects by addition to the Fantasy Glazes or by addition to other glazes in the Chrysanthos range.

3.22.2. APPLICATION

The Fantasy Enhancer due to its composition may settle over time. Care should be taken to properly shake the container to disperse the contents so that consistent results can be obtained each time the product is used.

Use the following as a guide as to how much Fantasy Enhancer may be added to Fantasy Glaze to create the different effects:

Qty of Fantasy Enhancer per 100 ml of Fantasy Glaze	Result
10 ml	Enhanced crystal growth, no increase in flow
20 ml	Enhanced crystal growth and glaze starts to flow a little
30 ml	Glaze and crystals become diffused and glaze runs freely

Note that when Fantasy Glaze is to run, be sure to stilt piece correctly and brush ample Kiln Wash onto shelves to prevent damage to shelves.

3.23. CLAY MENDER

3.23.1. USAGE

Chrysanthos Color Co. Ltd. Clay Mender is used to repair broken white earthenware, greenware and bisque. It may also be use as a binder for clay additions.

3.23.2. APPLICATION

Moisten broken edges of ware with clean water, then use fingers or a soft brush to apply a generous coat of Clay Mender. Quickly join pieces holding firmly for a few seconds to set. Add a little extra Clay Mender if necessary to cover breakage and sponge or scrape off excess. Fire between cone 06 (999^{o}C) and cone (1,060^{o}C). Clay Mender may be glazed over directly when applied to bisque.

3.23.3. PHYSICAL DATA

The maximum firing temperature of Clay Mender is cone 03 (1,101^{o}C) and it is not suitable for use on mid fire or stoneware clays.

3.24. KILN WASH

3.24.1. USAGE

Chrysanthos Kiln Wash is used to protect kiln shelves from glaze contamination during firing. Glaze that drips onto shelves coated with Kiln Wash may be easily removed.

3.24.2. APPLICATION

Apply Kiln Wash directly to shelf surface with a brush and let dry. Recoat as often as is necessary.

3.25. SNOW PUFF

3.25.1. USAGE

Chrysanthos Snow Puff Glaze is for creating a simulated snow effect on ceramic ware. The resultant finish is a puffy white matt glaze effect.

Snow Puff me be applied over other glazes and other colors of Snow Puff maybe created by adding small amounts of one stroke.

3.25.2. APPLICATION

Generally, to obtain optimum results, 3 heavy coats of the glaze should be applied using a fully loaded brush. Ensure each coat is dry before applying subsequent coats at right angles to each other.

Alternately, the glaze maybe applied with a spatula or sponged on depending on the effect required.

3.25.3. PHYSICAL DATA

Snow Puff is specifically formulated for application onto earthenware clay that has been bisque fired to between cone 04 (1,060^{o}C) and cone 03 (1,101^{o}C), then gloss fired to between cone 06 (999^{o}C) and cone 04 (1,060^{o}C).

3.25.4. SAFETY DATA

Chrysanthos Color Co. Ltd. Snow Puff Glaze is not for use on items where it is in contact with food.

4. NON-FIRED PRODUCTS

4.1. ACRYLIC COLORS

4.1.1. USAGE

Chrysanthos Color Co. Ltd. Acrylic Colors are a premium quality acrylic paint that is available in a wide range of colors. The Acrylic Colors have been designed for use on many surfaces including bisqueware, paper, wood, plaster etc. The Acrylic Colors are also suitable for dry brushing and air brushing.

The Acrylic Colors are highly pigmented and produce a consistently smooth and streak free finish when applied with a quality brush.

4.1.1.1. APPLICATION

Shake the Acrylic Color container vigorously to ensure contents are thoroughly mixed. Apply one or more even coats to the surface to be painted using a soft art brush, allowing coats to dry in-between. The number of coats that are applied depends on the porosity of the substrate. Generally one coat is sufficient to provide full coverage.

To seal the item, finish with a protective coat of brush on acrylic gloss or matt sealer that may be brushed on or sprayed.

Clean water may be added to the Acrylic Color if necessary to adjust for brushing or spraying.

4.2. PEARL COLORS

4.2.1. USAGE

he Chrysanthos Color Company Pearl Colors are a quality self sealing acrylic pearlescent lustre paint that is suitable for use on many substrates including bisqueware, glass, paper, wood, plaster, etc.

Pearl Colors applied to glass may be baked in an oven for 30 minutes at 200^{o}C to harden the decoration. After baking in an oven, the decorated finish is quite durable and is resistant to washing with warm water and soap. The decoration however is not abrasion resistant.

If used to decorate glassware, only areas not to come in contact with food should be decorated.

4.2.2. APPLICATION

Ensure the surface to be decorated is clean. Shake container vigorously to ensure contents are thoroughly mixed. Apply 1 or more coats using a soft art brush, allowing coats to dry in-between. The number of coats applied depends on the desired finish.

Clean water may be added if necessary to adjust for brushing or spraying.

4.3. METALLIC COLORS

4.3.1. USAGE

The Chrysanthos Metallic Colors are a quality self sealing acrylic metallic lustre paint that is suitable for use on many substrates including bisqueware, glass, paper, wood, plaster, etc.

Metallic Colors applied to glass may be baked in an oven for 30 minutes at 200^{o}C to harden the decoration. After baking in an oven, the decorated finish is quite durable and is resistant to coming off when washed in warm water and soap. The decoration is not however abrasion resistant.

If used to decorate glassware, only areas not to come in contact with food and the rims of glasses must not be decorated.

4.3.2. APPLICATION

Ensure the surface to be decorated is clean. Shake container vigorously to ensure contents are thoroughly mixed. Apply 1 or more coats using a soft art brush, allowing coats to dry in-between. The number of coats applied depends on the desired finish.

Clean water may be added if necessary to adjust for brushing or spraying.

4.4. DESERT SANDS

4.4.1. USAGE

The Chrysanthos Color Company Desert Sands are a quality textured surface acrylic paint that is suitable for use on many substrates including bisqueware, wood, plaster, card etc.

4.4.2. APPLICATION

Ensure the surface to be decorated is clean. Shake or stir contents well to ensure contents are thoroughly mixed. Apply 1 or more coats using a hard flat bristle brush. One coat should be ample however 2 coats maybe applied for an enhanced effect, allowing first coat to dry. Create interesting blends and textural finishes when combining 2 different 'Desert Sand' colours. Add medium or water sparingly to adjust brushing. Excess water may dampen the textured surface effect.

4.5. BRUSH ON ACRYLIC SEALERS

4.5.1. USAGE

Brush on Acrylic Sealers are available as a gloss and a matt and intended to seal and protect an item that has been first painted with Acrylic Colors.

If applied to ceramic ware decorated with Acrylic Color, the items painted are not suitable as functional ware.

4.5.2. APPLICATION

Shake the Acrylic Sealer container vigorously to ensure contents are thoroughly mixed. Apply two or more even coats over the Acrylic Color using a soft art brush, allowing coats to dry in-between. The number of coats that are applied depends on the surface being sealed.

Clean water may be added to the Acrylic Sealers if necessary to adjust for brushing.

4.6. ACRYLIC CRACKLE MEDIUM

4.6.1. USAGE

Chrysanthos Acrylic Crackle Medium is a water-based medium used to create an aged, cracked paint look. A non-fired product, it can be applied directly on to a plain surface, or on top of a color which will show through the cracks and contrast with the alternate color applied over it.

4.6.2. APPLICATION

Apply 1 - 2 coats of Acrylic Crackle Medium to a plain or acrylic decorated surface, allowing each coat to dry. If using a colored base coat, ensure it is thoroughly dry before applying medium.

Be aware that the color chosen as the base coat will show through the "cracks" the medium creates, if no base coat is used the natural color below will show through.

Ensure medium is thoroughly dry before applying top color. Choose a contrasting color to the base coat; load broad soft brush well with color and apply a single generous coat of color taking care not to rebrush as this will disturb the paint and ruin the effect.

Brush strokes may be applied in a single direction or cross-hatched to vary the direction of the cracking provided the area is painted over only once.

The crackle finish will begin to take effect immediately as the acrylic topcoat begins to dry, and will continue until completely dry.

Acrylic Sealer may be applied to protect the finish when dry.

4.7. CORROSION

4.7.1. USAGE

Chrysanthos Color Co. Ltd. Corrosion is a water-based product that once applied to earthenware greenware causes the clay to bubble and crater. The effect once dry is bisque fired then glazed over and refired.

Corrosion is used to create special effects on clay and is destructive in its nature so care she be adopted when using the product to ensure that only the areas where the effect is required are coated.

4.7.2. APPLICATION

Using greenware, decide what areas the effect is desired on and apply Corrosion liberally. The more Corrosion that is applied the more accentuated the effect, however beware not to overdo it as it also weakens the clay. Occasionally it may be appropriate to dip the piece in a container filled with Corrosion.

Once the piece has completed bubbling and cratering, allow it to dry thoroughly as you would greenware before firing. Once dry, it may be fired to harden the area so that other decoration can take place.

Any Corrosion that has been in contact with clay should be discarded and the remainder sealed in the container and stored in a cool dry place.

4.8. BRUSHING MEDIUM

4.8.1. USAGE

A medium to add to dry glazes, glazes with poor flow, in order to give good brushability.

Chrysanthos Brushing Medium can also be used to temporarily help reconstitute liquid glazes that have fallen out of suspension (ie. glazes that have separated).

Acrylic Color may be modified by the addition of brushing medium to create Translucent Stains.

4.8.2. APPLICATION

For glazes that have fallen out of suspension, decant the water from the top of the glaze and replace with Brushing Medium.

Amalgamate the glaze by shaking vigorously until a uniform mixture is obtained. The glaze can then be applied as usual.

For the creation of translucent acrylics, add approximately 40% brushing medium to 60% Acrylic Color.

4.9. WAX PROTECT

4.9.1. USAGE

Chrysanthos Color Co. Ltd. Wax Protect is a paintable water based wax emulsion used for selective decoration. It works by repelling underglaze or glaze colours that are applied over it (ie. the wax covers those areas not to be decorated). The wax is then fired off.

Wax Protect is useful for creating fine detail due to its brushability.

4.9.2. APPLICATION

Before application, the brush should be moistened thoroughly with liquid soap and any excess squeezed out. The brush is then loaded with Wax Protect and applied to greenware or bisque. Allow it to dry thoroughly before applying colour or glaze. Any excess should be dabbed off colour or glaze using a barely damp sponge, before firing to appropriate temperatures.

4.10. COLOR MASK

4.10.1. USAGE

Chrysanthos Color Co. Ltd. Color Mask is water based latex emulsion that is selectively painted on to greenware to protect areas from color, making design work and application of color easier. It can be used with fired and non-fired products and is peeled off before firing, although Color Mask will burn off during firing.

4.10.2. APPLICATION

A brush should be retained exclusively for use with Color Mask. A soft bristled brush will allow most even coverage.
Before application, the brush should be moistened thoroughly with liquid soap and any excess squeezed out. The brush is then loaded with Color Mask and applied in a single even coat to the area to remain without color. Wait a few minutes until the Color Mask is dry before applying color over ware.

Gently peel back the Color Mask, easing back edges using a tool or fingernail. Color Mask should come off in a single sheet, but ensure there are no fragments left behind. The blank areas remaining can then be decorated if desired, and subsequent coats of Color Mask may be applied if required.

Refer to Diagram 1 for example of using Color Mask.

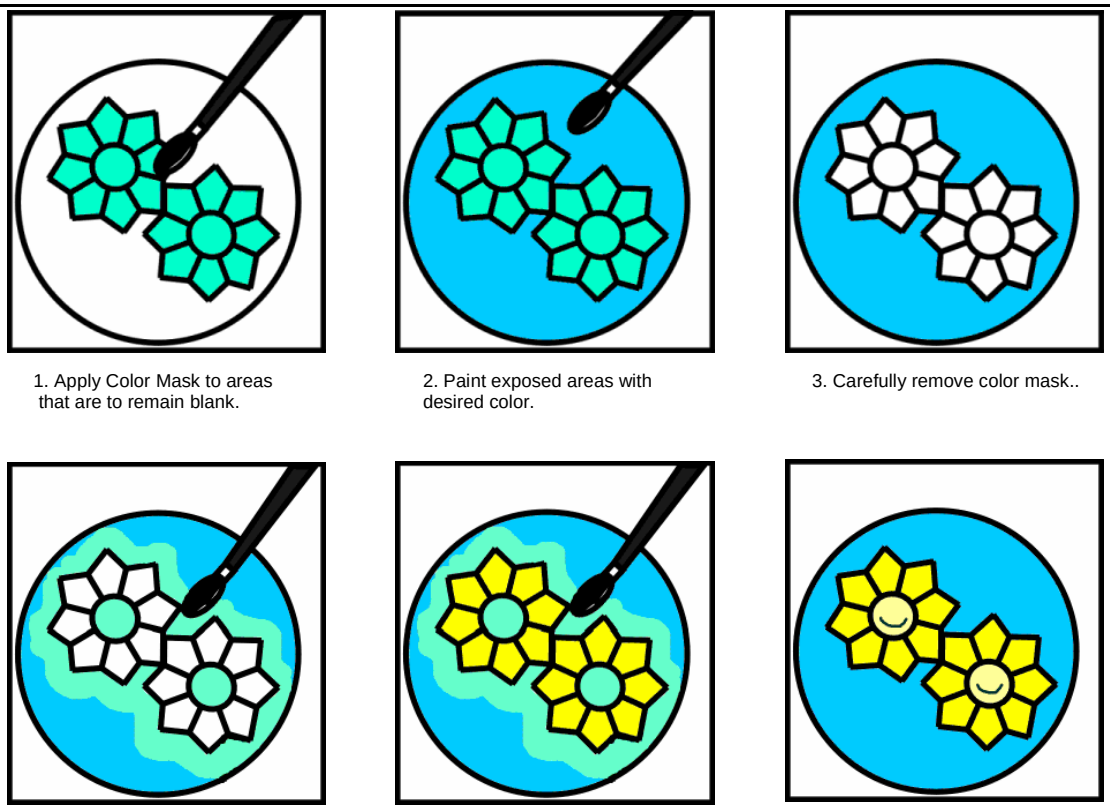
4.10.3. FURTHER POINTS

1. After application, Color Mask is dry when it loses its opacity and turns a translucent color, this generally only takes a few minutes.

2. If Color Mask lifts color: try removing excess color from latex surface by dabbing off with a damp sponge, then allow color application to dry thoroughly before removing latex, easing edges away carefully.

3. Color Mask may be used on bisque but can be harder to remove. Firing will remove any residual Color Mask off greenware, however if residue remains on bisque and glaze is applied directly over, the glaze will not adhere to these areas on firing when the Color Mask is burnt off.

4. Avoid getting Color Mask onto clothing, as it is difficult to remove from fibrous surfaces.



1. Apply Color Mask to areas that are to remain blank.

2. Paint exposed areas with desired color.

3. Carefully remove color mask..

4. Use subsequent applications of Color Mask if desired.

5. Apply alternative colors.

6. Remove Color Mask and finish any detail.

Diagram 1

4.10.4. CLEANUP AND STORAGE

Clean brushes in warm water immediately after use with liquid soap. Tightly cap container for storage.

5. CERAMIC INFORMATION

5.1. GENERAL

This section aims to provide the reader with information about ceramics in general. It provides concise information on tips, techniques, and methods used in ceramics to achieve different results.

5.2. APPLICATION TECHNIQUES

5.2.1. AIRBRUSHING[3]

Airbrushing can be used to achieve delicate and realistic details on figurines, for applying even color coverage to highly textured or carved surfaces and for general design work, border design etc.

Thin Underglaze with clean water in preparation for airbrushing. The amount of water required will depend on the viscosity of the individual color and on the application technique desired.

Thinning down of the colors implies that more coats will be necessary to achieve the same intensity fired color as with normal brushing. As a guide, if full intensity and depth is required, apply coats until the appearance of the unfired glaze matches that in the bottle.

Ensure the air brush itself is thoroughly clean and dry changing color. This is achieved by washing in warm water and then briefly operating the spray gun to expel any moisture.

For each new application, fill the clean air brush with color and test spray on a scrap of greenware or bisque to ensure color consistency and flow is correct.

Before spraying, mask off with Color Mask any areas that so not require spraying.

When spraying is complete, clean the spray equipment in warm water and set aside to dry.

5.2.2. ANTIQUING

A technique for highlighting incised or carved ware by applying color to crevices in such a manner as to cause an aged appearance.

This technique is suitable for fired and non-fired colors.

Apply one coat of water-thinned color to the bisque surface with a broad brush.

Texture and remove excess color from raised areas with a dampened sponge, cleaning sponge frequently with clean water. When sufficient color has been removed allow to dry thoroughly before clear glazing and firing (or sealing if using a non fired color).

[3] For air brushing difficulties, refer to "Spray Application Faults" section.

5.2.3. BANDING

Ideally for application to round or symmetrical shapes, banding is literally the application of bands of color to greenware or bisque. This is achieved by centering the ceramic ware on a rotating banding wheel and turning whilst holding a color-loaded brush against the surface.

The ceramic ware must be centred correctly in order to obtain uniform bands. This can be achieved by weighing down the piece by using an appropriately sized plastic bag filled with sand.

The brush used to apply the band will depend on the finish desired. The brush should be loaded with color and the wheel rotating before the brush comes in contact with the surface of the ware.

Banding can create a range of effects from a simple border design to a spiralling overall effect.

5.2.4. COLORING SLIP

The color intensity of Chrysanthos One Strokes make them highly effective slip colorants. The resultant colored slip can then be used to decorate ceramic ware.

It is difficult to know the percentage of colorant to add to the slip without experimentation. It is therefore desirable to run tests on small quantities first before embarking on the full-scale item. A good place to start is to mix thoroughly about one quarter by volume of One Stroke with slip. Fire and glaze the piece to determine color finish.

Colored slip has a variety of uses:

- It can be used to trail decoratively over wet greenware body of the same slip. If the surface is not sufficiently wet dampen with sprayed water to aid adhesion.
- Double casting. Quickly cast vase or other "container" mould using the colored slip, leave in the mould for only approximately 30 seconds before draining. When the slip is surface dry, fill the mould again with plain slip and complete casting to desired thickness. When the slip is sufficiently dry, un-mould and trim the casting. Carve the cast with surface decoration that will selectively remove areas of colored slip and expose the white slip beneath. Dry, clean, fire and glaze ware as usual.
- Imbed a colored slip design into the surface of ware. Open a two-piece mould - preferably of a plate or shallow bowl - and using the mould half that will cast the "inside" of the bowl or the "top" of a plate, trail a design using a slip-trailer and one or more colored slips. Allow design to dry to leather-hard before completing casting with white or other contrasting color slip.

Each of the pieces produced by these techniques should be dried, cleaned fired and glazed as usual;

- Depending on the color chosen, One Strokes will color the slip to pastel tones as the slip will act to whiten the color.

- The addition of Chrysanthos Color Co. Ltd. One Stroke colors to slip may retard the drying time of the cast, as a painting medium is added to the color to aid brushability and slow drying time.

5.2.5. MAJOLICA

A traditional method of decorating unfired white tin glaze with colored pigments and oxides that are then fused into the glaze surface on firing.

Apply 3 full even coats of white Superior Glaze to bisque ware. When dry, smooth off surface with a wrung-out sponge before decorating with One Stroke colors. It is important that color application is not overly heavy or clumped as it may not fuse into the glaze sufficiently. When necessary, thin One Strokes with clean water.

Fire decorated ware to recommended glaze temperatures.

This method can be emulated using Superior Glazes on White Superior Glaze base.

5.2.6. POLISHING

Also known as burnishing, this is a method traditionally used to polish clay using a smooth, hard object such as a pebble or the back of a spoon to compact the clay surface. A similar action can be applied to an Underglaze surface to achieve a satin like unglazed finish.

Apply 3 coats of Chrysanthos Underglaze to a greenware surface. It is preferable that the clay is still green rather than bone dry as this will prevent the Underglaze from drying out too quickly. When the final coat of Underglaze has been applied and is touch-dry, begin polishing gently with a wad of soft cloth or tissue. Do this in a circular motion, spraying the surface of the ware periodically with water if it dries out too much or becomes chalky.

When the desired surface finish has been achieved, the ware can be bisque fired as usual.

Polished color is not intended to be glazed over, however if applied to the exterior surface of a vase, for example, the interior could be glazed to render it watertight.

5.2.7. SLIP TRAILING

Slip trailing is the technique of trailing a line of slip over the surface of greenware or bisque to form a slightly raised decorative pattern that may be glazed and fired all in one application.

There are a variety of ways in which slip trail glaze can be used:

- For textured outlines over Underglaze and One Stroke decoration, which can then be clear glazed over.
- For creating textured design that can be glazed over with a single colored glaze to highlight the design. This technique is particularly effective with a translucent or semi-opaque glaze.
- For application over polished Underglaze; fired, and then left unglazed for an interesting textured finish.

- For outline design on bisque and when dry, flood the design with a variety of colored glazes.

5.2.8. SPATTERING

Using flecks of color to decorate ware either in single or multiple color layers.

To apply, load a stiff bristled brush with color of choice (One Stroke, Underglaze or non-fired color) and holding the brush about 10cm away from the ceramic ware, draw fingertips through the bristles to spatter color onto ceramic ware.

Spattering can be performed over a base color for a simple highlight, or it can be layered color-upon-color for a pebbled or granite-like finish. The possibilities are endless!

5.2.9. SPONGING

Sponging is an easy method of color highlighting. The technique can be applied as a single color on uncolored greenware or bisque, or over a contrasting base coat. Color can also be sponged in multiple layers to achieve overall color coverage with an interesting textural quality.

Sponging is performed by spreading some One Stroke or Underglaze onto a glazed tile or saucer. A barely dampened sea sponge is dabbed into color and blotted on the tile.

Commence by sparsely and randomly sponging color over the area to be decorated, rather than concentrating on small areas at a time, to ensure a more balanced finish overall. Gradually build up color until the desired effect is achieved.

If using more than one color, choose a complimentary range of colors. Tonal variations of a single hue; ie. dark to light tones of the one color, work well when layered, with or without a base color, from dark to light.

Single color sponging provides an attractive border effect on dinnerware and can be controlled by masking off with Color Mask.

5.3. BASIC FIRING TECHNIQUES/TIPS

Techniques for firing ceramic ware are almost as varied and numerous as the glazes and clays available.

To simplify things, the references in this section will generally be related to the firing of slip-cast white earthenware in electric kilns (unless otherwise specified). Much of the information however, will be universally applicable.

5.3.1. STAGES OF FIRING

Firing is the process of baking raw clay ware in a kiln in order to effect chemical changes that will strengthen the clay. The firing cycle has roughly 5 stages:

STAGE 1: Drying/water smoking occurs up to 150^{o}C, and involves the removal of residual water. The kiln should be well ventilated and the temperature rise gradual.

STAGE 2: Pre-heating occurs between about 300^{o}C and 800^{o}C. Again a controlled rate of heating should be employed for matter to be decomposed and expelled as gases before vitrification begins. Liberation of chemically combined water results in considerable weight loss and shrinkage of ware.

STAGE 3: Full fire occurs beyond 800^{o}C as is when rapid heating can be applied without damaging ware. The vitrification process continues and the body and glazes become mobile and begin to fuse.

STAGE 4: The Finish/soaking period allows reactions/fusion to complete to the desired extent. During this time maximum temperature is maintained to ensure even heat penetration throughout kiln and ware. The mobility of the body and glaze are at their peak and fusion continues.

STAGE 5: The Cooling period is from maximum temperature down to when the ware can be safely handled. As the temperature decreases, the body and glaze begin to contract and solidify.

5.3.2. KILNS

Gas fired and electric kilns are the two most commonly used in both studio and commercial situations. There are advantages and disadvantages to both systems and the choice of which to use can be influenced by numerous factors, including proposed location, availability of fuel, cost of fuel, size of kiln required, type of ware to be fired and maximum firing temperature.

There are other advantages and disadvantages which should be factored into making ones choice:

5.3.2.1. GAS KILNS

- Generally cheaper to purchase and operate as larger kilns.
- Reliance on bottled gas supply, if no natural gas available.
- Gas energy is more readily controlled as it can be instantaneously turned on and off; this can allow greater versatility in firing techniques and experimentation with glaze finishes. However, the nature of gas firing can also mean less predictable results.
- Can offer both oxidising and reducing atmospheres Reduction firing is essential for creating certain special effect glazes.

5.3.2.2. ELECTRIC KILNS

- While electric kilns can be expensive to purchase and run, smaller studio/hobby kilns can be competitively priced and when fully automated can be set to fire at off-peak times (ie. overnight and weekends) at significantly cheaper cost.
- Larger electric kilns that fire above 1000^{o}C generally require 3-phase power that can be expensive and requires council approval in residential zones.
- Electric kilns offer more predictable results due to the more stable atmosphere and more even distribution of energy via elements.
- Offers a neutral to oxidising atmosphere.

5.3.3. TYPES OF FIRINGS

While it is possible to decorate and glaze greenware and put it through a single firing, it can be difficult to do it successfully. Certain industries, such as some of the tile manufacturers, employ the single firing method for economic reasons - both money and time.

When firing earthenware it is more common to use a double firing method, both bisque and glaze.

5.3.3.1. BISQUE FIRING

Bisque or "bisquit" firing is the first firing of the raw clay which transforms it from a relatively weak and brittle material to a strong, durable but porous structure which can be safely handled and decorated and is receptive to glaze.

The cast or formed raw clay (greenware) needs to be thoroughly dry before being bisque fired. As there will always be residual water in the unfired body, the temperature of the bisque fire should be raised gradually and the kiln well ventilated initially (all bung holes open) to allow moisture to escape. As a guide the rate of temperature rise should ideally be no greater than 150^{o}C per hour.

If the ceramic ware is too wet when placed in the kiln, a rapid rise in temperature can cause the water to convert to rapidly expanding steam, forcing its way out of the clay by exploding the ware.

Greenware can be selectively stacked in the kiln for bisque firing as long as great care is taken when stacking ware inside ware, or onto wide-bottomed bowls or plates as the weight can cause them to crack during firing. Identical pieces (eg. mugs) may be stacked rim to rim for bisque firing in order to maximise kiln space. Ceramic ware will not stick to other ware during bisque firing as it is unglazed.

Something to be aware of when stacking decorated greenware is color transfer or color strike that can be a problem with cobalt colors in particular[4].

5.3.3.2. GLAZE FIRING

Even greater care should be taken when stacking glazed ware for gloss (or glost) firing. Glazed ware needs to be stacked so that pieces do not touch each other, otherwise when the glaze melts during firing it will fuse to adjoining ware. Ware should be separated by at least a few millimetres as glazes expand slightly on heating.

As earthenware is porous, the entire surface needs to be glazed in order to make it impervious, therefore ware needs to be stilted to prevent it from fusing to kiln shelves.

Stilts are usually formed from a 3-armed refractory base fitted with 3 or more, fine wire prongs on which the base of the ware is carefully balanced, so that it cannot tip over onto other ware.

[4] Refer to "Color Strike" section of this manual.

Stilts are easily removed after firing and any splinters of wire or glaze remaining can be carefully knocked off or sanded away carefully as these can be very sharp.

Kiln shelves can also be covered with a protective coat of Kiln Batt Wash that will prevent glaze runs or fallen ware from sticking to kiln shelves[5].

Earthenware glaze firing, as a general guide, should also be ventilated in the early stages to allow expulsion of moisture from the glaze application. The rate of temperature increase should not exceed 150^{o}C/hour, and this is recommended for a number of reasons:

- A gradual temperature increase allows more even and thorough heat distribution throughout the body of ware and kiln. Rapid firing causes heating of the ware closest to the elements or heating outlets without necessarily thoroughly heating the bulk of ware.
- Gradual heating enables organic matter to be properly burnt off and expelled as gases during the bisque fire. During the glost fire, gradual heating enables chemical reactions to be thoroughly completed in order for the glaze to be fully developed.
- Although there are several temperatures at which major chemical conversions occur, the most critical temperature during the firing process that can affect silica-bearing bodies on heating and cooling, is the silica inversion temperature of 573^{o}C. At this temperature silica experiences dramatic thermal expansion (on heating) and contraction (on cooling) which results in stresses being placed on the ceramic body, which can cause cracking[6]. Gradual heating and cooling over this temperature in particular minimises the risk of sudden expansion and contraction.

5.4. USING PYROMETRIC CONES

Pyrometric cones are heat-measuring devices in the form of small 3-sided pyramids made of different ceramic materials that are designed to melt at varying temperatures. Orton cones are perhaps the most commonly used and available cones.

Each cone is numbered and that number corresponds to the heat-work required (ie. the amount of heat over a given period of time) to slump that cone.

The following table shows the temperature equivalent of each cone number when fired at 60^{o}C/hour and 150^{o}C/hour.

[5] Refer to using "Kiln Wash" section of this manual.
[6] Refer to "Dunting" section of this manual.

ORTON STANDARD PYROMETRIC CONE CHART

Cone	60°C/hr	150°C/hr	Cone	60°C/hr	150°C/hr
022	576	586	04	1050	1060
021	602	614	03.5	1068	1080
020	625	635	03	1086	1101
019	668	683	02	1101	1120
018	696	717	01	1117	1137
017	727	747	1	1136	1154
016	764	792	2	1142	1162
015	790	804	3	1152	1168
014	834	838	4	1168	1186
013	869	852	5	1177	1196
012	866	884	6	1201	1222
011	886	894	7	1215	1240
010	887	894	8	1236	1263
09	915	923	9	1260	1280
08	945	955	10	1285	1305
07	973	984	11	1294	1315
06	991	999	12	1306	1326
05	1031	1046	13	1321	1346

Table 3

Most contemporary kilns will contain a pyrometer that will register the internal temperature of the kiln at the point where the thermocouple is situated, however, depending on the size and set-up of a kiln, internal temperatures can vary considerably (for example, from the top to the bottom of the structure). Pyrometric cones installed in various locations throughout the kiln can provide an accurate record of actual heat-work done. These are sometimes known as witness cones.

Cones are often used in sets of 3. The centre cone; the firing cone, represents the desired firing temperature. This is flanked by one cone number lower, the guide cone and one cone number higher, the guard cone.

Place the cones flat on their bases on a kiln shelf causing them to sit at the desired 8 degree angle. Alternately, place the cones side-by-side in a ready-made holder or a wad of properly dried clay, and then place the holder on a kiln shelf.

Cones should be located in line with a spy hole so they can be monitored. If the kiln is manually regulated, it may be turned off when the cones indicate the desired heat-work has been done.

According to Orton manufacturer's instructions:

> *"When the Guide cone starts to bend, you know your ware is approaching maturity. Deformation of the Firing cone indicates that firing is at the correct point. Bending of the Guard cone indicates you have exceeded the best point in the time-temperature relationship."*

Many enthusiast ceramic kilns are fitted with a kiln sitter. This is a mechanical device that can be fitted with a small cone that on slumping at the required temperature triggers a switch that automatically turns the kiln off.

5.5. FIRING TECHNIQUES

5.5.1. SOAKING

When firing with multiple witness cones temperature differences throughout a kiln can be clearly seen. Soaking the kiln can overcome this problem ie, holding the maximum firing temperature for a sufficient period of time to enable the temperature throughout the kiln and ware to become uniform.

The amount of soaking time required will depend on the size of the kiln and the temperature variations within. If unsure, experiment by placing cone sets in several different locations within the kiln, particularly in known or suspected hot and cold spots where previous firings have shown glaze to be under or over fired.

If cold spots are a problem, begin by soaking for 10 minutes. If cones still show incomplete firing, increase soaking time of subsequent firings by 10 minutes until the desired finish is achieved.

If hot spots are a problem decrease the firing temperature and soak as necessary. Because of the increased heat distribution, soaking is effectively equivalent to firing up to a higher temperature without soaking. Again, conditions vary from kiln to kiln so experiment by dropping the temperature by between 10^{o}C or 20^{o}C initially.

An important function of the soaking period is in helping to develop the buffer layer; a variable intermixed layer of clay body and glaze. Creating a good buffer layer helps to reduce the risk of crazing or peeling, it evens up the differences between the glaze and body thermal expansion, and imparts additional strength to the entire piece.

Soaking allows time for necessary heat-work to be done and glaze to be properly developed. Excessive soaking however has the same effect as over firing, even at lower temperatures[7].

Soaking is predominantly associated with glaze firings, however some potters and ceramists soak their bisque firings in order to ensure all carbonaceous matter is burnt off to avoid any problems with bloating during the subsequent glaze firing.
Note: If the kiln is manually regulated but switches off automatically when maximum temperature is reached, you will need to turn the kiln back on as necessary in order to soak.

5.5.2. KEEPING RECORDS

The type of clay body and glaze, the amount of ware packed into a kiln, the thickness of the ware and the type of kiln fuel and insulation, will all have a bearing on the time and temperature of the firing. Keeping a careful record of each firing and any alterations made to the routine will help you to replicate good results and solve problems as they arise.

[7] Refer to “Problem Solving” section of this manual.

5.5.3. LOW BISQUE/HIGH GLOST vs HIGH BISQUE/LOW GLOST

Potters and ceramists employ two distinct firing methods. Most industry, studio potters and ceramists, use clays and glazes that are designed to be low bisque fired (usually around 1000^{o}C) then glaze fired higher.

The hobby industry, however, tends to high bisque firing and low glost.

5.5.3.1. LOW BISQUE/HIGH GLOST

- Ware is bisque fired to sufficiently alter the clay's composition so that it becomes hard enough to handle and absorbent enough to receive glaze without breaking down in water when dipped.
- Highly vitreous ware such as stoneware and porcelain are extremely difficult to glaze unless low bisque fired.
- Raw (non-fritted) glazes need to be high fired to fully develop their chemical compositions in order for glaze to correctly mature. In most cases, needing a reduction atmosphere to force the glaze to penetrate into the surface of the body.

5.5.3.2. HIGH BISQUE/LOW GLOST

- As the glaze firing never exceeds the temperature of the bisque firing, the bisqued ware remains relatively inert; therefore there is less chance of further gas release that can cause bubbling through the surface of the glaze.
- The risk of warping while stilted and under the weight of glaze is minimised.
- Glaze and body interface or buffer layer is not as well developed.

5.5.4. EFFECTS OF REFIRING

While refiring ware can successfully repair some glaze faults, it can also be a very hit-and-miss process.

The effects of refiring can be similar to excessive soaking resulting in color change, altered surface texture and deformation of ware. This is due to the fact that a different body is being fired (as firing changes have already been effected), and the firing cycle may no longer be suitable.

5.5.5. GLAZE/BODY COMPATIBILITY

Glazes and bodies are not universally compatible, that is in terms of a glaze fitting the body on which it is applied without crazing or peeling.

While crazing, as a decorative effect may be desirable in some instances, it is a particularly undesirable finish on porous utility earthenware.

When trialing a new glaze or body the manufacturer/supplier should be able to recommend a compatible clear glaze or body to match[8].

5.5.6. VARIATIONS IN FIRED COLOR

The intensity of a color under or in a glaze is also influenced by the firing cycle. It is affected by the thickness of the application, the type of body to which it is applied, the type of glaze (eg. whether lead-bearing or lead-free, satin or gloss etc.), the time and temperature of the firing, and the kiln atmosphere (oxidising or reducing).

[8] Refer to “Casting and Firing Faults” section of this manual.

6. PROBLEM SOLVING

6.1. GLAZE/UNDERGLAZE FAULTS

6.1.1. COLOR BLEED

Color bleed most often happens when decorated greenware is under fired (bisque), One Stroke or Underglaze color is applied too thickly, or glaze is over-applied or over fired.

It also tends to happen more on vertical pieces and usually with dark cobalt-based colors, ie Cobalt Black or Cobalt Blue.

REMEDIES

- Avoid over-application of clear glaze.
- Fire ware away from hot spots in kiln.
- Reduce firing temperature or soaking time for glaze firing.
- For hobby ware, increase bisque firing to correctly fuse the color to ware.
- For low bisque/high glost, decorate on bisque and glaze over directly.

6.1.2. COLOR STRIKE

Also known as flashing and can occur when strong oxides (such as cobalt) volatilise out of ware or glaze during firing and strikes other ware, usually directly above or beside it.

REMEDIES

- Take care when placing decorated greenware for firing as the decoration can be transferred from the top of a plate, for example, to the underside of a piece resting on top of it. Beware also of ware that is signed on its base.
- Color strike can also affect kiln shelves however; Kiln Batt Wash on kiln furniture will remedy this.
- Placement of glazed ware should be carefully considered to avoid placing too close to other ware and elements or hot spots in kiln.

6.1.3. CRAWLING

Bare (unglazed) patches are left on the ware's surface after glaze firing and the glaze tends to pool. This is caused by:

- Dust or grease eg from fingers, on ware before glazing.
- Over-handling of glazed and unglazed ware.
- Overly thick glaze application.
- Over grinding/high-clay glazes resulting in high wet to dry contractions.
- Soluble salts in body, i.e. over deflocculated clay.

REMEDIES

- Ensure bisque ware is scrupulously clean before glazing.
- Avoid using hand creams that can leave grease spots.
- Frequently change cleaning up water (adding a little vinegar) and avoid over-sponging of greenware that can draw soluble salts to the surface.
- Reduce thickness of glaze application. If glaze is too thick, thin as necessary with clean water.

6.1.4. CRAZING

One of the most commonly encountered glaze faults, crazing appears as a series of hairline cracks in the glaze after firing.

Crazing occurs most commonly as a result of mismatched thermal expansions of the body and glaze and falls into two categories being either immediate or delayed crazing.

Immediate crazing is usually caused by the glaze and body having different thermal expansions; overly thick glaze application; or in the case of hobby ceramics, if the glaze and body are matched, then the bisque may be under-fired. It occurs as ware cools or soon after it is removed from the kiln.

Delayed crazing occurs over time (often weeks or months later) as moisture is absorbed into the body causing it to expand, or as ambient conditions alter considerably and in both instances causing fractures to appear in the glaze.

REMEDIES

- Fire earthenware to higher temperature or increase soaking time, or add silica to body; this will increase the shrinkage (ie. thermal expansion/contraction) and make the body more vitreous (ie. less porous and less absorbent).
- Hobby ceramists should ensure that their bisque firing is at least 2 cones hotter than the glaze firing if using a hobby glaze.
- Soaking will also help develop a good buffer layer that will reduce the risk of crazing.
- Make glaze application thinner with clean water.
- When glazing earthenware, avoid dry footing. Coat ware entirely and stilt to minimise possibility of moisture absorption.

Ensure that the glaze you use is matched to the clay body (i.e. that they have compatible thermal expansions). A rule of thumb is that the glaze has a expansion coefficient about 15% less than the body.

6.1.5. DEVITRIFICATION

Devitrification means without glass. The effect is a matt or milky finish in what should be a glossy glaze. Devitrification is caused by:

- Dust or grease on ware before glazing.
- Slow cooling causing precipitation in early stages, resulting in crystal deposits on glaze surface.
- Under-firing results in a dry, matt appearance due to under-development of glaze, when insufficient time and heat has been applied.
- Over-firing volatilises certain components resulting in a starved and matt glaze appearance.

REMEDIES

- Speed cooling during early stages while glaze is still liquid (to about 750^{o}C) to avoid risk of crystal development.
- Ensure glaze is fired to correct temperature.
- Use a fritted lead-bearing glaze rather than lead-free. As a low viscosity glaze with a broad firing range and high refractive index, the surface of a lead-bearing glaze will tend to even out on firing and produce good gloss.

6.1.6. GLAZE SEPARATION

Underglazes and glazes can sometimes separate, with solids falling out of suspension to the bottom of the glaze container.

REMEDY

- To reconstitute the underglaze or glaze, carefully tip out the clear water from the container into a measuring cup. Remove only clear water otherwise color/glaze may become deficient in essential ingredients. Replace the water with the same quantity of Chrysanthos Color Co. Ltd. Brushing Medium and stir thoroughly to amalgamate.

6.1.7. OVER-FIRING

Over-firing of a glaze by excessive and/or prolonged heating results in the volatilisation of certain components leaving the glaze surface looking starved, dry and matt.

The glaze appearance on over-firing is similar to an under-fired glaze where the glaze is insufficiently developed. Over-firing however, can also result in:

- Deformation of ware (i.e. warping).
- Weakening of the ware as excessive glass is formed and structure becomes brittle.
- Excessive contraction of the body.
- Discoloration of the body and glaze.
- Bloating of body.

REMEDY

- Reduce firing time and temperature.

6.1.8. PEELING

Also known as shelling, peeling is the opposite of crazing, and is due to the body thermal expansion being greater than that of the glaze; therefore as the ware cools the body contracts more than the glaze, causing the oversized glaze to separate from the body.

Peeling occurs mainly around rims or sharper edges of ware, such as handles, where tension is greatest. It is also caused by the migration of soluble salts to the surface of ware, resulting in poor glaze adhesion.

REMEDIES

- Reduce body thermal expansion by:
  - reducing firing temperature
  - reducing soaking time
  - reducing silica content of body.
- Avoid over-sponging greenware when cleaning.
- Add 0.01% Barium Carbonate to clay to counter soluble salts[9].

6.1.9. PIN HOLING

When it occurs in glaze after firing, pin holing is caused by the expulsion of gases from the body or glaze and can be due to:

[9] Refer to "Soluble Salts" section of this manual.

- Under-firing or over-firing of glaze.
- Under-firing bisque.
- Over-application of underglaze.
- Dust specks on bisque that can prevent dipped glaze from adhering properly.
- Overly thick glaze application.
- Firing glaze too quickly.
- Too high a percentage of recycled clay mixed with fresh clay.

REMEDIES
- Increase or reduce firing temperature or time according to need.
- Apply thinner underglaze or glaze application.
- Reduce speed of firing.
- Ensure ware is properly cleaned before glazing.

6.1.10. POOR GLAZE FLOW

As an application problem, poor glaze flow is mainly caused by moisture being absorbed from the glaze into the greenware or bisque too quickly, causing the brush to drag.

REMEDY
- Can be remedied by adding Chrysanthos Color Co. Ltd. Brushing Medium[10].

6.1.11. SPRAY APPLICATION FAULTS

Airbrushing problems can be minimised by familiarising oneself with the manufacturer's instructions for operation of the airbrush. When glazing, one of the more common problems encountered is orange peeling, where on spraying the surface of the glaze has the dimpled finish of an orange peel. It may be due to excess air through the gun or spraying too close to the ware.

REMEDIES
- Reduce air pressure or volume.
- Move spray gun back from ware.

6.1.12. CURTAINING

A broad glaze run that can be the result of:
- The glaze being too thick.
- Too low a glaze density.
- Spraying too closely.
- Hard bisque causing low porosity.

REMEDIES
- Water down glaze or deflocculate.
- Increase glaze density by evaporating excess moisture.
- Increase distance between spray gun and ware.
- Reduce bisque fire or add 0.5% to 1% Brushing Medium for a slight flocculating effect which will make the glaze more viscous and help it adhere to the body more successfully.

[10] Refer to "Brushing Medium" section of this manual.

6.1.13. GLAZE FAILS TO SPRAY

This may be the result of:

- Air pressure too low.
- Glaze too thick.
- Blockage in air line.

REMEDIES

- Increase air pressure.
- Thin glaze and ensure it is free of lumps.
- Clear air-line[11].

6.2. BODY FAULTS

6.2.1. BLOATING

Trapped gas bubbles in the body during firing build up pressure causing expansion of body.

Trapped carbonaceous matter in the clay, particularly in vitreous ware, forms large bubbles as a result of ware being fired too rapidly. Over-firing tends to produce smaller bubbles as certain materials volatilise when taken beyond their maximum working temperatures.

REMEDIES

- Reduce speed of firing.
- Reduce maximum firing temperature.

6.2.2. BLOW-OUT OR SPIT-OUT

Craters left in the bisquit body known as blow-out or spit-out, are caused by contamination of the clay. In cast bodies this is most frequently caused by particles of plaster from the mould that become caught in the casting.

REMEDIES

- Use more refined or filter pressed clays.
- Ensure plaster moulds are properly cleaned of any loose plaster before casting.
- Remove any plaster from casting before firing.

6.2.3. BODY EXPLOSION

The clay ware explodes or fractures during firing due to water trapped within the ware rapidly expanding as steam, and forcing its way out.

This can be a problem with very thick ware, or ware that has been too rapidly dried, resulting in the surface pores of the clay closing up as it dries and blocking the passage for interior water to escape.

REMEDIES

- Ware should be dried at a speed not exceeding the rate at which water can be carried via capillaries from the centre to the surface of the ware therefore, slow down the rate of drying. A cool to warm breezy atmosphere is more efficient than a hot, still atmosphere, for drying.

[11] Refer to air brush's manufacturers instructions.

- Ensure ware is thoroughly dry before firing.
- Reduce speed of firing.

6.2.4. DUNTING

The splitting of ceramic ware during heating or cooling of the firing cycle. Dunting is the result of dramatic thermal expansions and contractions of silica at certain temperatures, resulting in changes in volume and consequently placing stresses on the body.

Dunting is caused by:
- Heating and/or cooling ware too rapidly, particularly at the silica inversion temperature of 573^{o}C and to a lesser extent 224^{o}C.
- Overly thick body.
- Broad variations in thickness of body.

REMEDIES
- Heat and cool ware at a slower rate, particularly over silica inversion temperatures.
- Pay careful attention to thickness and shape of ware whether casting or throwing.

To determine whether Dunting has taken place during heating or cooling:
- If edges are softened with glaze flowing into the crack, the Dunting has occurred on heating.
- If the crack has a clean, sharp edge through the body and glaze, then the Dunt has occurred on cooling.

6.2.5. SOLUBLE SALTS

The presence of soluble salts in clay can cause:
- Slip instability.
- Peeling of glaze.
- Casting marks.
- Localised areas of vitrification on firing.
- Scumming on fired surface, especially terracotta.

Soluble salts such as calcium and magnesium sulphates, iron salts, and sodium chloride, are more prevalent in colored clays, but can be a problem with casting slips.

REMEDIES
- Use filter pressed clays. Filter pressing minimises the presence of soluble salts.
- Avoid over-sponging of ware when cleaning greenware, particularly rims and sharp edges, as this draws the salts to the surface.
- Change sponging water frequently when cleaning ware, adding a dash of vinegar.
- When drying, if possible invert ware such as mugs and vases. Salts tend to migrate upwards so if ware is inverted the salts will migrate to the foot rather than the rim of the piece.
- Add 0.01% - 0.02% Barium Carbonate to clay to render the soluble salts insoluble.
- Keep plaster moulds clean by washing casting surfaces where salts can build up.
- Keep moulds as dry as possible.

- Excessively long drying time aids migration of salts therefore speed drying time.

6.2.6. WARPING (DEFORMATION OF THE BODY)

Occurring after drying or after firing clay body, warping can be the result of:

- Bad handling of greenware after casting or throwing.
- Removing castings from moulds too soon.
- Uneven drying of ware.
- Drying ware on an uneven surface.
- Firing ware too rapidly.
- Firing ware on warped kiln shelves.
- Inadequate or uneven stilting or firing supports.

Some shapes are more prone to warping during drying and firing (such as broad, thin pieces), as are certain clays (eg. porcelain, which becomes vitreous on high firing). These should be taken into consideration when choosing moulds, clay, and firing Atmosphere etc.

REMEDIES

- Avoid handling greenware until sufficiently hard. Leave castings in moulds until hard enough to handle safely.
- Dry ware carefully and avoid excessive heat. Dry ware on flat surface to avoid tile warpage by turning tiles frequently to ensure even drying on both sides.
- Balance ware carefully to ensure sufficient stilt support for firing.
- Reduce speed of firing to maximum 150^{o}C hour.

6.3. CASTING FAULTS

6.3.1. CASTING (HARD SPOTS)

A discolored spot on cast ware that shows up on firing and can be quite vitreous, making it difficult to glaze over.

Casting spot occurs where the slip first contacts the mould when pouring causing heavier particles in the slip to be compounded against the mould.

REMEDIES

- If the pouring hole is sufficiently large, move the slip container continuously whilst pouring (eg. in a circular motion).
- Pour over the back of a spoon or stirring stick to disperse the pouring.

6.3.2. COLLAPSED CASTING

Where casting is found to have collapsed before removal from the mould. This is caused by creation of a vacuum when the mould is drained too quickly.

REMEDY

- Drain mould slowly, tipping to invert carefully, and ensuring air is not precluded from entering cavity.

6.3.3. FLABBY CAST

Castings don't harden quickly enough and are too soft to handle without distortion due to overly high thixotropy.

REMEDY

- Add more deflocculant to casting slip.

6.3.4. POOR DRAINING

Due to low slip fluidity making draining of moulds difficult from narrow openings and causing overly thick castings.

REMEDIES

- Check that litre weight of slip is the correct weight according to manufacturers instruction. If it is, add deflocculant to the slip to make it more fluid. If the litre weight of the slip is too high, add clean water to increase fluidity.

6.3.5. PINHOLING

In a cast body can be the result of:

- Slip being too thick causing air bubbles to be trapped when pouring.
- Pouring slip too quickly.
- Dirty specks in mould that become trapped under the surface when pouring, then burn out during firing to leave pinholes.

REMEDIES

- Check that slip is sufficiently fluid[12].
- Pour slip more slowly.
- Ensure moulds are perfectly clean before using.

6.3.6. SLOW CASTING

Casting process taking too long is due to:

- Slip fluidity too high.
- Moulds being too wet.

REMEDIES

- Reduce amount of water or deflocculant added to slip.
- Do not allow moulds to become too wet.

6.4. GENERAL

6.4.1. KILN BATT WASH

Using kiln batt wash will help to prevent kiln furniture from being damaged by color strike, dripping glaze, fallen glazed ware etc. Kiln Batt Wash is intended to be painted on to kiln shelves (and supports if desired) in a thin coat, and will prevent glaze from permanently fusing to furniture. It can be sanded back and re-coated as necessary, stirring well before each use.

6.4.2. SINGLE FIRING FAULTS

Faults associated with ware that has been fired only once ie. bisque and glaze in one.

[12] Refer to “Poor Draining” remedy.

6.4.3. MORTING

A fault of once-fired ware which occurs when ware is dipped in a half-dry state causing rapid swelling and resulting in stressing of the body between dehydrated and re-hydrated layers. This causes the clay to shear into thin paper-like layers parallel to the surface.

REMEDIES

- Increase glaze density by reducing water content in dipping glaze. Correct fluidity by using deflocculant such as Calgon or Dispex
- Ensure greenware is dried to a maximum of 1% moisture.

6.4.4. OTHER

To avoid problems such as bloating and crawling in once-fired ware:

- Avoid excessive handling of greenware.
- Ensure surface is dust free before dipping.
- Ensure kiln is well ventilated to allow moisture to escape, and that firing is slower than normal bisque.
- In order to ensure organic matter is properly combusted and gases expelled ware should be fired very slowly between 600^{o}C and 1000^{o}C at a rate of 60^{o}C per hour.

7. GLOSSARY OF CERAMIC TERMS

This section of the manual provides an alphabetically listed glossary of ceramic terms.

7.1. ACCENTING

The process of emphasising an area with lighter or darker colors, by shading or outlining.

7.2. ABSORPTION

The ability of a clay body, raw or fired, to soak up moisture. The rate and amount of absorption is dependent on the porosity of the body.

7.3. ADD-ONS

Greenware parts that are added to the main casted piece (example: handles to cups).

7.4. ADHERENCE

The ability of a fired or non fired color to stay in place on a given surface.

7.5. AIR-BRUSHING

The process of applying color with the use of a small air-pressure gun. Used for shading and general decorating.

7.6. ANTIQUING

Decorating process in which you remove applied color to accentuate detail.

7.7. ANTIQUING GELS

Non-toxic, non-fired water based colors that can be used to antique over non-fired colors.

7.8. ANTIQUING SOLVENT

A thinner for air-brushing non fired oil based colors. Antiquing solvent can also be used as a cleaner/conditioner for brushes used with oil based colors.

7.9. APPLIQUE

A type of ceramic add-on.

7.10. BANDING

Applying color to ware in decorative bands, usually using a banding wheel.

7.11. BANDING WHEEL

A hand operated turntable used in banding and other types of decorating.

7.12. BARIUM CARBONATE

Small quantities (<2%) can be added to the clay body to help prevent scumming and combat soluble salts. This material is highly poisonous and must be handle with extreme care.

7.13. BATT (KILN BATT)

Highly refractory kiln shelving for supporting ware during firing.

7.14. BATT WASH (KILN BATT WASH)

A refractory wash that is applied to kiln furniture to prevent glaze from sticking during firing.

7.15. BINDER

Material such as gum Arabic, added to hold ceramic ingredients together.

7.16. BISCUIT (BISQUE)
Ware that has been fired but is not yet glazed. Bisque firing converts raw clay ware to biscuit.

7.17. BLISTERING
Refers to the appearance of broken bubbles found on the glazed surfaces of fired ceramic pieces.

7.18. BLUNGER
A mixing machine for slip. Powdered or plastic clay is placed into the bowl of the blunger along with water and deflocculant and a rotating propeller mixes the material into slip.

7.19. BODY
The clay from which ware is made.

7.20. BONE ASH
An opacifying agent in glazes and an essential ingredient in bone china bodies, bone ash comes from calcined ox bones.

7.21. CALCINE
To heat a material in order to remove unwanted carbonaceous and other volatiles so as to purify and concentrate.

7.22. CASTING
The process of filling a plaster mould with casting slip (liquid clay) to create a clay object. Once the plaster mould is removed, the clay object is known as greenware or unfired clay.

7.23. CASTING SLIP
Clay that has been liquefied from dry or plastic state through the addition of water and deflocculants.

7.24. CLAY CARBON
Carbonless paper used for transferring design onto greenware.

7.25. CLAYS

- **BONE CHINA -** Bone china is a very white, hard and translucent type of English porcelain. The properties of the clay and thus the name are derived from the addition of calcined bone (bone ash).

- **CHINA CLAY -** Also known as KAOLIN, is a fine white primary clay used in the manufacture of other clays such as earthenware and porcelain, as well as in glazes.

- **COLORED CLAY -** Refers to non-white clays such as terracotta.

- **EARTHENWARE -** Refers to lower-fired clay bodies which remain porous beneath the glaze surface. Glaze maturing temperatures are generally between about 1060^{o}C and 1120^{o}C, however "hobby" is fired lower and other earthenware glazes higher.

- **FIRECLAYS -** Are used in the manufacture of refractory materials and are able to withstand high temperatures.

- **PLASTIC CLAYS –** As opposed to slip, is in solid pliable form used for throwing on a potters wheel, hand building, sculpting etc.

- **PORCELAIN -** Is a fine, hard, white vitrified clay body that is high-fired. Porcelain glaze maturing temperatures range from about 1220^{o}C to 1360^{o}C.

- **RAKU -** Is a low-fired, heavily grogged open clay body of Japanese origin, covered with a low-melting glaze. When glaze is molten, ware is removed from the kiln and subjected to heavy reduction or other treatments in order to create interesting glaze effects. Raku glazes are generally fired between about 900^{o}C and 1000^{o}C.

- **SLIP -** Is liquefied clay.

- **STONEWARE -** Is a hard, opaque, stone-like clay usually fired between 1200^{o}C and 1300^{o}C to vitrify.

- **TERRACOTTA -** Refers to low-fired, porous, colored clay with a high iron content that results in a rich red-brown color when fired. Traditionally left unglazed.

7.26. CLEANING GREENWARE
The process of removing mould seam lines and imperfections from unfired clay objects.

7.27. COEFFICIENT OF THERMAL EXPANSION (COE).
Provides a measure of the amount that a material expands as it is heated. The device used to measure this property is a Dilatometer.

7.28. CONES (PYROMETRIC)
Heat measuring devices made from various ceramic glaze materials and formulated to bend and melt at given temperatures, recording the heat-work done[13].

7.29. CRATERING
Refers to moon-like craters that may appear on a glazed surface.

7.30. CRAWLING
Refers to a glaze defect in which the glaze pulls away or crawls away from the bisque, leaving bare bisque areas.

7.31. CRAZING
A glaze defect in which hairline cracks appear on a fired glaze surface.

7.32. CROSS HATCH
A decoration technique that calls for applying alternate coats of color at perpendicular angles.

7.33. DECAL
A design, printed with ceramic colors on special paper, which can be applied to the surface of the ware and fired for permanency.

7.34. DEFLOCCULANT
An alkaline electrolyte which is added to a clay slip or glaze in order to separate the particles and increase the fluidity, without the addition of water.

[13] Refer to "Using Pyrometric Cones" section of this manual.

In slip, Sodium Silicate and Dispex are commonly used. Only a very small addition is generally required to modify slips and care must be taken not to over-dose.

These deflocculants have a peak, beyond which the reverse effect is achieved and flocculation occurs ie. the slip thickens.

7.35. DILATOMOTER
A device that measures the expansion or shrinkage of solids with changing temperature. It is used to measure this property in glazes and clays.

7.36. DIPPING GLAZE
A method of applying glaze by immersing a piece in a container of glaze.

7.37. DRY BRUSHING
An effect achieved by applying non-fired color very lightly with an almost dry brush.

7.38. DRY FOOTING
Leaving the bottom of a piece unglazed so that stilting is not necessary.

7.39. DUNTING
Is cracking of the body due to thermal stresses caused by too rapid heating or cooling of ware.

7.40. ELECTROLYTE
A substance that dissolves in water to give a solution capable of conducting an electric current.

7.41. EMBOSSMENT
A raised design on a clay piece.

7.42. ENGOBE
A white or colored slip that may incorporate some glaze materials and is generally applied to the raw body. Will not fuse on firing and may be glazed over.

7.43. FERRULE
The metal band of brush just below the bristles.

7.44. FILTER PRESSING
A mechanism for removing surplus water from slip to create bats of plastic clay. A by-product of the process is the effective removal of soluble salts from the clay, which are discharged in the water.

7.45. FIRING
The process of maturing ceramic products by varying degrees of heat. Firing usually takes place in a kiln.

7.46. FLASH
The undesirable transference of a soft glossy sheen onto unglazed ware when high fired glazed and unglazed ware are fired together.

7.47. FLASHING
Refers to the shiny edges on ware, often produced by over firing.

7.48. FLOW
Term used when referring to the running or moving qualities of a glaze.

7.49. FLOWING COAT
The terms used to describe applying color with a well-loaded brush.

7.50. FLUX
A substance which is added to glaze or clay in order to lower the melting point of the material in which it is present.

7.51. FOOT
The bottom of a ceramic item.

7.52. FRIT
A frit is a part of a glaze recipe that has been melted, cooled, then ground before being added to the glaze recipe. Fritting renders the glaze insoluble and non-toxic, as the bulk of chemical reactions are completed away from the clay body[14].

7.53. FURNITURE
Implements used to make full use of a kiln's capacity (shelves, posts and stilts).

7.54. GLAZE
A specially formulated glass designed to be applied and fired onto ceramic ware, adding decoration and making it impervious to water.

7.55. GLAZE BRUSH
A brush with long full hairs for the application of glazes and underglazes.

7.56. GLAZE BUTTING
Is the term used to describe the placement of two or more glazes in close proximity on the same piece.

7.57. GLAZE TRAILING
The use of a fine-tip squeeze bottle to "trail" one glaze over another to create a raised design.

7.58. GLAZE FIT
In terms of thermal expansion, glaze fit refers to the suitability of a glaze for the body to which it is applied. A good glaze fit is demonstrated by its ability to expand and contract with the body on heating and cooling without crazing or peeling.

7.59. GLOST
Means glazed, hence glost firing refers to glaze firing.

7.60. GRAINING
The process of creating a wood grained effect using thinned, non fired colors applied in long uneven patterns.

7.61. GREENWARE
Raw formed but unfired, clay ware.

7.62. GREENWARE DRILL
Small tool with a threaded point used for drilling holes in dry greenware.

7.63. GREENWARE PREPARATION
Involves the removal of mould seam lines and imperfections from the unfired clay objects.

7.64. GREENWARE SAW
Small tool having a serrated edge for cutting dry greenware.

[14] Refer to "Fritted Glazes" section of this manual.

7.65. GROG
Ground bisque of fine to coarse texture that is added to clay in order to impart strength, open-up the texture of the clay, and reduce shrinkage. As the grog has been pre-fired it remains relatively inert and stable.

7.66. HARD BISQUE
Ware that has been fired to witness cone 04 (1049^{o}C).

7.67. HARD SPOT
Areas that will reject color, and sometimes cause ware to have bare spots. Commonly caused by improper greenware casting.

7.68. HIGH FIRE
Ceramic articles or glazes that are fired to witness cone 04 (1049^{o}C) or higher (stoneware and porcelain).

7.69. IMMATURE BISQUE
Ware that has been fired cooler than witness cone 04 (1049^{o}C).

7.70. INCISING
Technique of cutting a clay surface to create a design.

7.71. INGLAZE
When oxides or colorants (such as underglaze) are painted on to an unfired glaze surface, then fired to fuse the colorant into the glaze.

7.72. KILN
A heating chamber for hardening and maturing clay and glazes.

7.73. KILN FURNITURE
Implements used to make full use of a kiln's capacity.

7.74. KILN WASH
A coating used on the tops of kiln shelves and kiln floors to protect them from glaze dripping.

7.75. LACE TOOL
A long, pointed tool used when applying thin strands of clay.

7.76. LEATHER HARD
A term used to describe clay items that are damp, but firm enough to handle without losing their shape.

7.77. LINER BRUSH
A brush used for fine lines and design work.

7.78. LOADING
Completely filling a brush with color.

7.79. LUSTRE
Metal salts that are suspended in a resin base are painted as a thin coating on to a fired glaze surface and refired, generally between about 700^{o}C and 900^{o}C and result in an iridescent or metallic finish.

7.80. MAJOLICA TECHNIQUE
Application of underglazes in a design over an unfired non-moving glaze.

7.81. MATURING POINT
The temperature needed to mature glaze and clay.

7.82. MODELLING CLAY
Prepared clay used for hand modelling.

7.83. MOULD
Hollow plaster-of-paris form in which articles are reproduced using clay slip.

7.84. NON MOVING GLAZES
Ceramic glazes that move or flow very little in the glaze firing.

7.85. NON TOXIC
A term used to describe paint products that contain no material in sufficient quantities to be toxic or injurious to humans. Labels on bottles must advise of any toxic ingredients.

7.86. ONGLAZE
Decoration that is applied on to the fired glaze surface and fired to make permanent (eg. lustres, decals).

7.87. OPAQUE
Non transparent color.

7.88. OVERGLAZE
Decorative finish applied over a fired glaze surface and made permanent by firing. Examples include mother-of-pearl and gold finishes.

7.89. OVER GLAZE COMPATIBLE
A glaze that will accept overglazes for a third firing. Glazes that contain copper for added color are not overglaze compatible.

7.90. OXIDATION
Firing of the kiln with ample air supply to allow thorough combustion of gases and carbonaceous matter.

7.91. PALETTE KNIFE
Flexible knife with no sharp point for mixing or stirring color.

7.92. PINHOLES
Tiny holes penetrating a glazed surface.

7.93. PLASTICITY
Pliability of modelling clay.

7.94. POROSITY
The permeability of fired or unfired clay.

7.95. POSTS
Columns of refractory material used to support shelves inside the kiln.

7.96. POUNCING
A technique in which you only apply color with quick up-and-down movements with a brush or sponge.

7.97. POURING
The process of filling a plaster mould with casting slip to create a clay object. Once the plaster mould is removed, the clay object is known as greenware or unfired clay.

7.98. PYROMETER
An instrument that indicates temperature in the kiln.

7.99. REDUCTION
Reduction firing of the kiln (as opposed to oxidation) results in incomplete combustion due to insufficient oxygen in the kiln atmosphere. Consequently oxygen is drawn from the clay body and glaze in order to complete chemical reactions, resulting in changes in color and composition of the ware.

7.100. REFRACTORY
A material that is particularly heat resistant and able to withstand high temperatures.

7.101. ROLLING CONSISTENCY
Refers to the consistency to which glazes are thinned for rolling inside ware.

7.102. ROLLING GLAZE
A method of covering the inside area of ware by rolling thinned glaze inside.

7.103. RUBBER SCRUBBER
A square sponge that has an abrasive surface on one side. Also known as a Grit Sponge or Grit Cloth

7.104. RUNNING
The fluidity of a glaze at the point of maturity before cooling and hardening.

7.105. SCORE
The process of scratching tiny crisscross lines on areas of greenware that will be fastened together with products such as clay mender.

7.106. SCRUB COAT
A priming coat of thinned opaque underglaze or glaze.

7.107. SEALERS
Spray or brush-on coatings for use over non fired colors to protect the surface and enhance the colors.

7.108. SEAM
A ridge formed in greenware where mould pieces join.

7.109. SGRAFFITO
The process of creating a design in wares by gently scratching through applied color to reveal the color or the clay body beneath it or to create carved designs.

7.110. SHELF SUPPORTS
Columns of refractory material used to support shelves inside the kiln.

7.111. SHELVES
Flat slabs of special high temperature materials on which ware is placed inside kilns.

7.112. SILK SPONGE
Used for decorating. It has short hairs on its surface and is soft when wet.

7.113. SHIVERING
Occurs when the glaze or underglaze and the clay body are incompatible. The clay body shrinks more than the color, causing the color to peel or break away.

7.114. SHRINKAGE
The reduction in size of a clay object as a result of firing.

7.115. SILICA
One of the most important ingredients in ceramics that is used in the manufacture of clay bodies and glazes.

7.116. SLIP
Clay in liquid form.

7.117. SLIP CASTING
The process of forming clay ware from liquid clay (slip) in plaster moulds. The slip is poured into the mould and left for sufficient time to create a shell of suitable thickness, before the excess slip is drained. When it is hard enough to be handled without distortion, the cast piece is removed from the mould and cleaned, dried, decorated and fired as required.

7.118. SLIP TRAILING
The process of applying slip, via an applicator bottle, to obtain a raised effect.

7.119. SMOKING
The greying or discoloration of glaze, caused by underfiring.

7.120. SOAKING
The process of holding a certain temperature in the kiln for an extended period.

7.121. SOFT BISQUE
Ware that has been fired to witness cone 06 – 05 (991 – 1031^{o}C).

7.122. SOLVENT
Dissolving agent used in antiquing and to clean brushes used with oil-based colors

7.123. SPATTERING
A method of applying small flecks of color to ware, usually with a bristle brush.

7.124. SPONGING
The use of a sponge to apply colors directly to the surface of a piece.

7.125. STAGGERING
The process of applying separate successive coats of glaze by fractions of an inch to prevent glazes from flowing together.

7.126. STENCIL
The process of using paper perforated with a design through which color can be brushed or sponged onto a surface.

7.127. STILTS
Supports used to separate a glazed article from a shelf during firing.

7.128. STIPPLING
A method of applying color by pouncing the tip of a brush loaded with color against the ware.

7.129. TERRA-COTTA
A natural low fired clay. Terra-cotta is also color name.

7.130. THERMAL EXPANSION/CONTRACTION
Ceramic materials expand during firing as heat energy activates molecules. Likewise, thermal contraction occurs on cooling.

7.131. THERMAL SHOCK
Stresses caused by dramatic temperature differences throughout ware can result in cracking of glaze and body; due to sudden or dramatic temperature variations.

7.132. THIXOTROPY
The thickening or gelling of flocculated slips on standing. Agitating the slip will make the slip more fluid again.

7.133. TINT
The process of lightly applying diluted colors over a base coat or coloring a product with another product.

7.134. TIPPING
Involves touching tip of a loaded brush with other colors for muted shading or accenting.

7.135. TRANSLUCENT
Transparent color, allowing color underneath to show.

7.136. UNDERGLAZE
Colorant that is applied to raw or fired clay body then glazed over.

7.137. UTILITY ITEM
Functional rather than decorative item.

7.138. VISCOSITY
The rate of resistance to flow.

7.139. VITREOUS
Glass-like impervious ware with little or no porosity.

7.140. VITRIFICATION
The process of glass-forming of materials or body on firing as vitrification increases, porosity decreases.

7.141. WARE
Another name for clay, or an item of clay. Unfired clay is known as greenware; after firing it becomes known as bisque (ware).

7.142. WASH
A term used for color and water solution used for standing and antiquing.

7.143. WATER BASED ANTIQUING GELS
Non-toxic, non-fired water based colors for antiquing over non-fired colors.

7.144. WOOL SPONGE
(Or Sea Wool Sponge) is an open textured sponge and soft when wet.