

## Glaze Additives and Brush-on Glaze

Applying a glaze by brush has some specific advantages compared to spraying; glazes can be applied in a painterly manner, wasting of materials is minimized and there is no costly investment of tools and equipment. However, there is a down side; applying an even coat is a challenge. The best result is obtained if a glaze is applied in several layers. But once the first coat has dried it is difficult to obtain an even second or third coat, because each coat is highly absorbent and while brushing a new coat the previous coat(s) tend to be partly washed away and/or can cause pinholes to occur that will remain visible in the final glaze. This is the case particularly if a glaze has a moderate to low kaolin content, even more so if no kaolin is present. An unfired glaze layer is often vulnerable; parts of glaze can easily be knocked off causing a disruption in the fired glaze. Introducing a CMC gum in combination with a plasticizer helps to obtain better results. The occurrence of glaze faults will decrease and keeps the ingredients in suspension.

### CMC

Kaolins are able to retain water, which results in a smooth glaze that is easier to apply. Approximately 25% of kaolin works well. Kaolin does not make the second coat less absorbent, so while applying the second coat pinholes can occur. In addition, 25% of kaolin will result in the glaze layer to shrink a lot during drying. This can cause insufficient adherence, particularly if applied to biscuit ware, hence crawling of the final glaze tend to occur, particularly if the glaze has a high surface tension.

Adding a CMC gum can help. There are several reasons why:

- 1) Added in the right amount, CMC retains water even better than kaolin. It has a strong ability to let a glaze layer smooth out evenly. This results in less pinholes in the glaze, fired and unfired.
- 2) CMC gum acts as a deflocculant, especially when kaolin is present. This means less water is needed to make a glaze flow well, which means less shrinkage.
- 3) A CMC gum allows the glaze to adhere well to the piece, so this will greatly reduce the chance of crawling.
- 4) All particles in the previously applied layer will stick firmly together and the layers will be less absorbent. This allows another layer to be applied more evenly and is less subject to pinholing.
- 5) Finally the unfired glaze layer will be much less vulnerable while handling the piece and because CMC thickens ingredients are kept in suspension, hence the glaze batch will not settle.

CMC stands for carboxy methyl cellulose, it is a product made of organic materials. Besides cellulose, sodium oxide is also present. The amount of sodium oxide determines the potential for deflocculation. A high sodium content allows for a higher deflocculation rate, a low amount of sodium yields a stronger gluing capacity. In Alfred we use **Aqualon 7L**, this is a CMC glue with a high deflocculation potential and only moderate gluing capacity.

### Bentolite

In case less than 25% of kaolin is present a plasticizer can be added to compensate for the decline of paintability. **Bentolite L10** is a brand name of a plasticizer available in the Alfred glaze lab. it is a special kind of clay with very high plasticity and a very low iron oxide content. Bentolite should not be confused with bentonite, an ingredient often found in glazes recipes. Bentonite is not as plastic of a material and it has a higher iron oxide content.

The CMC, Bentolite water ratio will be discussed on the next page.

### CMC / Benolite / Water Ratio

The table below provides the ratio of CMC, Bentolite and Water for brush-on glazes. Important to note; glaze additives should be evenly dispersed before water is added, this prevents it from becoming lumpy. For this all ingredients have to be dry mixed first. Use a bucket with lid and shake thoroughly for 2 minutes. Leave the bucket closed for 5 minutes for the dust to settle. Add indicated amount of water into the bucket, close the lid and shake thoroughly again. Allow the dust to settle and the glaze additives to absorb water before opening the bucket. After sieving check if the water content is right by dipping your brush into the glaze slop and observe how it flows down the side while emptying the brush on the rim of the bucket.

### Raw Pieces and Porous Biscuit

For raw ware and porous biscuit the glaze should flow slowly. Add some water if no flowing occurs. If it flows swiftly probably too much water is added and more dry glaze should be added.

To determine the final amount of water two layers of glaze should be applied on a test piece that matches the dryness of the raw piece, or has the same porosity if biscuit. The first layer should smooth out just fine. Allow it to dry before the next is applied. If needed add a bit more water until the second layer also smooths out well.

### Non-Porous Biscuit or Glazed Pieces

As the table indicates, less CMC and much less water is needed in case of a non-porous biscuit or a glazed piece: In this case to find out about the right amount of water observe how the glaze flows down the side of the bucket as well: it should not flow at all, only smooth out a bit. Apply two coats on to a high biscuit or glazed test piece. Apply the next layer as soon as the first layer is not shiny anymore but still dark in color. If needed add a bit more water up to the point a more or less smooth second layer is obtained.

**Note! If more than 75% of water is needed to make the glaze smooth out a calculation or weighing error has occurred. Particularly CMC thickens a glaze; adding water up to a familiar consistency will lead to a too thin of a glaze coat.**

Brush-on Glaze				
Condition of the piece	Amount of kaolin present in the glaze	CMC Aqualon 7L	Bentolite L10	Amount of water to start
Raw or biscuit fired	25% or higher	1%	0%	50%
	20%	1%	0.3%	
	15%	1.1%	0.6	
	10%	1.1%	0.9%	
	5%	1.2%	1.2%	
	0%	1.2%	1.5%	
Non-porous biscuit or glazed	25%	0.5%	0%	35%
	20%	0.5%	0.1%	
	15%	0.5%	0.2%	
	10%	0.5%	0.3%	
	5%	0.5%	0.4%	
	0%	0.5%	0.5%	

### Brushing a Glaze onto your Piece

To obtain the best results first a thin layer of glaze is to be rubbed into the surface of a raw and porous biscuit piece by using a bristle brush. This will allow irregularities or cavities to be filled with glaze and as such reduces the chance of pinholing considerably. For this a small part of the prepared glaze is put into a small container and extra water is added up to a doubling of the volume is obtained after which the solution is thoroughly mixed. After this thin layer, two or three more layers are applied using the initially prepared glaze and a softer brush, like a haka type of brush. For non-porous biscuit or glazed pieces applying a thin layer first is not necessary. It can take a while before each layer will dry. Be patient, do not use a blow dryer as it increases the chance of crawling.