Ceramic Materials and Practices from Antiquity to Circa 1900.

Acid etching

The etching of glazed and gilded surfaces is carried out with the use of a diluted solution of hydrofluoric acid. The item to be etched is first of all coated with an acid resistant film e.g. gutta percha to protect those parts of the gilding required to be completed with a shiny surface whilst concurrently leaving the unprotected areas exposed to the vapours rising from containers positioned below. This potentially hazardous process was, nevertheless, popular during the second half of the nineteenth century, especially amongst manufacturers engaged in the production of the more expensive table and ornamental wares. Acid etching was and is a procedure requiring care because its corrosive vapours can have a devastating effect on skin and bodily organs. A similar decorating technique was also practised amongst glass makers, especially those engaged in the production of decorated window glass.
Acid etching as practised in connection with fine art and the book printing trade has been used for the purpose of applying patterns to ceramic surfaces. Wedgwood, for example, during the nineteen twenties and thirties issued a category of bone china decorated in a style known as 'Fairyland lustre' after designs by Daisy Makeig Jones. Makeig Jones whose art training at Torquay School of Art had focussed on the practice of copper plate etching adapted its procedures as a preliminary stage in the preparation of copper plates which were further subjected to hand working by the company's engravers. It is believed the earliest examples of ceramic printing used acid etching at an earlier stage in the preparation of printed subjects from contemporary book illustrations.

Agate ware

Agate ware describes a variegated marble-like effect resulting from the wedging together of two or more clays. Agate wares are known in early Chinese earthenwares, especially from the T'ang dynasty AD 618-906, and similar wares attributable to areas of Roman occupation of the first century AD. Agate effects enjoyed a revival during the mid-eighteenth century in connection with earthenwares from Staffordshire and the French town of Apt, especially from the fourth quarter of the eighteenth century. Although it is known that the Fulham potter, John Dwight issued salt-glazed stonewares in variegated clays during the 1680s and 90s it was Josiah Wedgwood who perfected the technique in association with his Neo-classical wares of the 1770s.

Alkaline silicate glaze

The earliest evidence concerning the use of alkaline materials in glazes may be traced to Predynastic Egypt. Arthur Lucas (Ancient Egyptian Materials and Industries) reports (pages 196/197); 'The possibility of the use of plant ashes of a particular kind containing a high proportion of alkali in the form of sodium carbonate cannot be ignored, since an ash containing sodium carbonate was obtained from special plants grown in localities bordering the Mediterranean, chiefly Spain, but also Sicily, Sardinia and the Levant.' The alkalis, to which he refers, barilla and roquetta, were also used from the medieval period in glass production e.g. Venetian 'cristallo'. These materials were initially prepared from the ash that resulted from burning, for example, barilla, a species occurring as a form of sea weed.
Natron, a natural compound of sodium carbonate and sodium bicarbonate, was used by the Egyptians in their production of an impressive category of turquoise coloured ceramics identified as quart-glazed fritware that appeared from the Eighteenth Dynasty circa 1300 BC.

Analysis carried out in connection with later wares from the Near East e.g. Persia and Turkey reveals the use of alkalis in the form of sodium and potassium. When combined with certain oxides, e.g. copper and cobalt, alkaline glasses are characterised by an impressive richness of colour.
Alkaline glazes, unless adequately fritted by prior fusion in a crucible, are prone to devitrification arising from their solubility in damp/wet conditions. Evidence of devitrification appears in the form of a surface iridescence that may, in extreme cases obscure any underlying decoration. While some collectors may value iridescence as a sign of authenticity the effect may be created intentionally with the aim to deceive.
From the eighteenth century alkaline materials were used by porcelain manufacturers notably at Meissen, Sevres, Chelsea and Minton for the purpose of creating pink and turquoise grounds on expensive table and ornamental wares. Alkaline materials were also incorporated with lead etc. in the formulation of onglaze enamels. A popular alkali for this purpose was borax prepared in the form of a boro silicate frit.

Alumina

Alumina was not consciously added to clays and glazes until the late nineteenth century on account of its high melting point (approximately 2040 deg. C.). Most ceramic compositions mature at temperatures below 1400 deg. C. unless required for highly specialised purposes.
When added to glasses and glazes in small amounts alumina can prevent the development of devitrification and recrystallization. Glazes that are low in alumina may have a rough and/or mottled surface.
Prior to the development of advanced analytical procedures, from the mid nineteenth century, there was a greater empirical understanding of the properties of flint and sand which, of course, contain alumina in varying amounts, and their beneficial properties as body and glaze constituents. When added to glazes high in lead flint can prevent crazing and result in glasses and glazes with good gloss characteristics or a high refractive index. The presence of silica in a body is necessary for the creation of a glaze from salt. The country that invented saltglazing, Germany, would have used a fine silica sand for this purpose prior to the availability of calcined flint.

Antimony

In an oxide form (Sb2 03) antimony oxide has been used principally as the source of a rich yellow glaze, glass or enamel since the medieval period, especially when combined with lead oxide. Antimony also has an opacifying effect in glasses and glazes. A particularly impressive example of the use of antimony as a source of yellow is to be found in Italian maiolica wares from the Renaissance.

Aqua regia

Aqua regia is an alternative name for nitro muriatic acid used in the process of dissolving gold as a preliminary stage in, for example, preparing purple- coloured enamels. Aqua regia consists of a mixture of concentrated nitric acid and hydrochloric acids 1 to 4 by volume. It is a highly corrosive solution that in addition to dissolving gold will attack or dissolve many substances unaffected by other reagents.

Arcanum

Arcanum (meaning secret recipe) is term adopted in a ceramic context with the discovery of materials which would reproduce the qualities, essentially whiteness and translucency, of Chinese porcelain. Originally identified with experiments undertaken for the purpose of creating gold from base metals, hence arcanists, there is more than an implied association with Friedrich Bottger's failure in formulating a recipe for this purpose. History reveals that he went on to re-establish favour with his patron, Augustus the Strong of Saxony, by focussing his alchemic abilities on inventing a hard-paste porcelain.
From the end of the sixteenth century there emerged some rather bizarre accounts of Chinese making practices as in the following description from Cardan (1550);
'It is certain that porcelain is likewise made of a certain juice which coalesces underground, and is brought from the East.'

Arsenic

Arsenic melts under pressure at 817 deg. C. Early published enamel recipes occasionally include arsenic in small proportions. Why it was believed to offer advantages over any other source of opacity in glass/glazes is difficult to comprehend. William Evans, for example, in his Art and History of the Potting Business, 1846 includes the following recipe for a 'white enamel';
'16 lbs. flint glass, half a pound of arsenic, half a pound nitre, 5lbs. litharge.
He recommends calcining the mixture in a biscuit oven and in a saggar that is well flinted and 'wadded'.
An emerging awareness during the nineteenth century of the mineral's extreme toxicity led to a reduction in the use of arsenic across a range of industries from ceramics to textile dyeing. In enamel painting, for example, it was often reported that workers would wet pencils or brushes between their lips the reputed sweet taste of arsenic dangerously disguising its now well-known toxicity.

Asbolite

Asbolite is an alternative term for an impure cobalt ore used in the production of Chinese ceramics. Asbolite has been quoted as containing 2-20% cobalt. There are thirty-four cobalt-yielding minerals that have so far been identified. In modern accounts of this mineral the word asbolite has been replaced with asbolane.

Ash pit

An ash pit is an area located below the fire box/grate for the containment of ash created by burning fuel. Examples of kilns incorporating an ash pit date from antiquity viz. 1st. century AD.

Aventurine glazes

Aventurine glazes owe their distinguishing characteristics to the presence of crystals of varying size, even when on the same piece, suspended throughout the glaze. Glazes of this type are usually what the chemist intended. However, they may be the result of unusual circumstances attributable to the glaze's iron content or, alternatively, kiln conditions. An

early writer on Chinese glazes, A.L. Hetherington in his book Chinese Ceramic Glazes, 1937 provides a refreshingly clear analogy for the circumstances that underlie glazes of this type:

'…..if you were to place in a beaker of water some pieces of common salt, the latter would readily dissolve; but after frequent additions, a point would be reached when the cold water ceased to dissolve any more. If, however, the beaker of water were heated, the undissolved salt would disappear and also go into solution. The process would be continued until even the hot water ceased to absorb any more, and what is called a saturated solution at that temperature would be formed. If this hot saturated solution were to cool, some of the salt would come out of the solution and be deposited as crystals in the bottom of the beaker. The hot liquid glass or glaze corresponds to the water and the ferric oxide is the counterpart of the salt.'

In this instance Hetherington is using the water and salt analogy to illustrate the conditions responsible for a category of Chinese stonewares of the temmoku family. A typical temmoku piece with what has been identified as a 'hare's fur' glaze indicates the presence of an excess of iron oxide and a slow cooling phase. What can happen if the cooling is hurried is well illustrated with reference to certain so called iron-glaze wares made in Staffordshire and elsewhere during the seventeenth century. Like their Chinese counterparts they too owe their characteristic brown to black glazes to a significant iron content. However, the attractive hare's fur effect seen on Chinese stonewares has not in this case developed due to a quick cooling phase. This may be explained with reference to the superior heat retaining properties of Chinese kilns as opposed to the much less efficient kilns developed during the seventeenth century in England.

Modern potters who have experimented with aventurine glazes have discovered that a high zinc content in the glaze aids the development of crystals. The presence of some rutile or titania also favours crystalline development.

During the late nineteenth/early twentieth centuries there was a particular enthusiasm amongst glaze chemists for novel effects typified by attempts to recreate the transmutation or flambé glazes originally developed in China during the Ming dynasty and later. Potters in France, England and Denmark, especially men with a background in industrial ceramics, were enthusiastic about also creating aventurines. With the advent of Studio Pottery from the 1920s its exponents were critical of these Chinese-inspired glazes judging them to be over refined and superficial.

Bag wall

A bag wall was included in an oven's construction to prevent the intense heat from the fire boxes coming into direct contact with the wares/saggars. In down-draught ovens the bag wall assisted in directing the gases up to the crown and down through the whole setting to the floor and ultimately to an outside chimney.

Baiting

Charging the kiln/oven with fuel; a procedure normally associated with the later stages in a firing.

Ball clay

Ball clay is a term applied to clays possessing high plasticity and what may prove to be inconveniently high shrinkage rates for certain purposes unless suitably tempered with kaolin, china clay or a none plastic additive such as calcined flint. Ball clays are subject to further individual types depending on their carbon content. Blue clay, for example, is frequently mentioned in many old recipes. Pipe clay is also a category of ball clay.

Early supplies of this type of clay were identified as ball clay due to the practice of forming it into large cannon ball size units thus rendering them suitable for transportation by pack horse. The British ceramic industry obtained its supplies from mines in Devon and Dorset. A typical use of ball clay is its addition to china clay in order to render the latter more workable. In instances when supplies contain undesirable iron impurities the resulting body may be improved by the addition of calcined flint.