# *Ceramic Raw Materials Dictionary:*

Alphabetical information on pottery glaze making materials and clay body ingredients:

**ADDITIVE A -** This clay conditioner gives clay more plasticity, higher green strength and greatly increased workability throughout our range of pre-mixed clays. The most dramatic improvement is in porcelain, white stoneware and sculpture clays. This additive has been thoroughly tested and will not change the color or texture of the fired clays. It can be used in any type of clay mixing. It will reduce mixer or pug mill power requirements by 25%, saving cost and wear in your clay mixing machines.

**ALBANY SLIP SUBSTITUTE -** Sheffield Pottery Incorporated has developed an Albany slip substitute utilizing a native glacial clay (see Sheffield clay) blended with an assorted amount of fluxing agents. This slip glaze produces a rich brown semi glossy glaze at cone 8-10 which mimics Albany slip glaze in reduction and oxidation firings.

**ALUMINA HYDRATE -** Al(OH)3 (m.p. 3722o F/2050o C) is used primarily in glazes as a source of Alumina. It is often favored over the oxide (Calcined Alumina) form due to its promotion of glaze adhesion and its capacity to remain suspended in a glaze. It is also used in salt glaze, bungs, and kiln wash.

**ANTIMONY OXIDE -** Sb2O3 (m.p. 1166o F/630o C) used in glazes as an opacifier and colorant (rarely, due to cost). However, its primary use is as a colorant (cone 06-1). In the presence of Lead or Iron, it will produce yellow. It is slightly soluble and very toxic.

**BALL CLAY** - is so named because it was first sold in England in the shape of a ball. It is a fine particle size secondary clay containing montmorillonite as its chief clay mineral constituent. It is essentially free of Iron and other impurities, and it fires to a light grey or buff color. It is used in clay bodies (rarely alone due to excessive shrinkage) to promote plasticity and higher firing ranges (cone 5-13). It is also used as a source of Alumina in high temperature glazes (cone 8-13), and it helps to keep a glaze slip in suspension.

**BARIUM CARBONATE -** BaCO3 (m.p. 2480o F/1360o C) is used in glazes as the typical source for Barium. It has limited use due to its lack of reactivity and toxicity. In low fire glazes (cone 06-5) it promotes matt (sometimes dull) finishes. However, at high temperatures (cone 8-13), it is a powerful flux. It is used in clay bodies to control scumming by rendering sulfates insoluble.

**BENTONITE -** Al2O3l5SiO2l7H2O is a decomposition product of Volcanic Ash resulting in a super fine (colloidal) clay. Montmorillonite is the major clay mineral constituent. The combined effect of the particle size and mineral make-up provides the unique quality that promotes plasticity in clay bodies (typically <4%), and enhancement of glaze suspension (typically <2%).

**BONE ASH -** 3CaOlP2O5 (m.p. 2462o F/1350o C) Natural: Bone Ash is prepared by calcination of selected animal bones (especially cow bones; some CaCO3 contamination) and then ground to a predetermined particle size. When Phosphate is added to a glaze it tends to cause opacity, too much is likely to cause crawling or blistering. It is used as a flux in higher fired glazes (cone 8-13), and also as flux in porcelain bodies where it is known to enhance translucency.
Synthetic: Bone Ash is produced from other non-bone Calcium Phosphate sources such as; the mineral apatite [Ca5(PO4)3 (OH,F)].

**BORAX -** Na2Ol2B2O3l10H2O (m.p. 1366o F/741oC) this compound is also known as Sodium Tetraborate. Granular: Borax (5 and 10 mol.) has a coarse particle size (99.9% <2.4 mm), and is readily soluble in water and can, therefore, have limited use in an unfritted form. It is used in a glaze as a source of both Sodium and Boron, and it is a rigorous flux in low fire glazes (cone 06-5) due to its decomposition temperature. Used in small amounts (<10%) in high temperature glazes (cone 8-13), it can increase the fluidity of the glaze to help heal over defects (scratches, cracks or pitting) at the maturing temperature. Excess use can cause pinholing and blistering.
Powder: (Borax 5 and 10 mol.) behaves the same as the granular form in a glaze. However, when a more rapid solubility (minutes versus hours) is needed the powder is preferred.

**BORIC ACID -** H3BO3 is soluble and has limited use in glazes due to other insoluble sources; i.e. fritted forms. When used as the only flux in an alkaline glaze it is less likely to cause crazing than Sodium fluxes. Boric Acid can be used in a clay body when introducing alkalies, however it is not advantageous, and Boron is a key element.

**CALCINED ALUMINA -** Al2O3 (m.p. 37[illegible]a eucicing , atteduci,u sbe [illegible]

c

**ERSTLEY BORATE -** 2CaOlB2O3l5H2O (m.p. 1225o F/660o C) is a hydrated Calcium Borate with Sodium as an impurity (< 5%). Its water solubility is minimal and, therefore, it is one of the only quasi-insoluble sources of Boron other than fritted form. It is widely used as a low-temperature flux and has the advantage of producing low temperature leadless glazes that tend to craze less than other Alkaline varieties. It also tends to advance a milky blue opalescence to a glaze that contains it as flux. (2CaO.3B2O3.5H2O) can be s

**SODA ASH -** (a.k.a. soda ash light) - $Na_2CO_3$ (m.p. 900o F/490o C) anhydrous sodium carbonate is a very active flux for low temperature glazes (below cone 5). However, it is water soluble and is generally used in fritted form to prevent recrystallization in the glaze suspension. Glazes which use raw Soda Ash should be well-ground and used immediately, or dry-ground and only the amount needed mixed with water. Soda Ash is also used in small amounts as a deflocculant (see Darvan #7) in clay slips to reduce the amount of water needed to make the slip fluid. Sodium bicarbonate ($NaHCO_3$) can be substituted as a deflocculant for Soda Ash, however, the amount should be doubled.

**TIN OXIDE -** $SnO_2$ (m.p. 2066o F/1130oC) is found in nature as the mineral Cassiterite. It is the most effective opacifier at all temperature ranges from terra cotta to porcelain. Amounts of 4-5% are typical, however, as little as 2%, and as much as 8%, are used in a glaze. If quantities above 8% are used it should be calcined to red heat (850o F/450o C) to prevent crawling of the fired glazes. Any of the Zircon opacifiers such as Zircopax, or Superpax will substitute, althoug8QuRTw/YWcZYeaHYHdHYHdQtRTw/YW]][ddHYHdQ

**YELLO OCHRE -** Fe2O3lH2O Limonite (m.p. 2415o F/1325o C) is common in earthenware clay sources (rarely used in glazes as a colorant) and is one of the primary yellow or buff colorants in raw clay. When fired, the molecular bound water evolves off and forms Red Iron Oxide (Fe2O3). It is a significant source of red color in earthenware clay bodies. Used in Engobes as a colorant to produce ochre yellow, tans, and browns. Naturally occurring Yellow Ochre is less expensive than manufactured Yellow Iron Oxide.

**INC OXIDE -** ZnO (m.p. 3272o F/1800o C) is derived from Zinc Sulfide ores. It is an important component of many glaze types (cone 5-13) and is used as a flux, opacifier, and color modifier. It reduces the expansion of a glaze (second only to Magnesia), improves craze resistance, gloss, whiteness, and increases maturing range. In crystalline glazes, low in Alumina, it profa]ebHYH]QaRTay