2.3 CERAMICS

2.3.1 Introduction

The word "Ceramics" is derived from the Greek word "Keramos" which means "burat material". The science of pottery is called ceramics. Ceramic materials are made from burning clay materials, which are made of inorganic silicates, metallic oxides and their combinations. In other words ceramics are thermosetting plastics.

Ceramics are any inorganic, non-metallic solids produced by burning at elevated temperatures.

Components of Ceramics

Ceramics generally consists of the following three major components.

(i) A fine grained (or) plastic portion: It imparts plasticity and workability. e.g. clay.

(ii) A crystalline (or) non-plastic portion: It contributes to mechanical strength, e.g. Silica.

(iii) A flux (or) glassy material: It helps in bonding and cementing the ingredients together. e.g. Feldspar.

2.3.2 General methods of Fabrication process

The common methods of fabricating ceramic wares involve the following steps

Step 1: Moulding

(a) Soft mud process: This is the oldest method of moulding clay article on the potter's wheel liggering is the most popular soft mud process used in white ware manufacture to form cups and saucers, plates and high voltage insulators.

(b) Dry Pressing: In this method, the ceramic ware is moulded under pressure, which redives the moisture content to 5-15%. This method is used for producing floor tiles, refractors, electrical insulators, etc.

(c) Hot Pressing: In this method the die and the plunger are usually made of graphite. It involves sintering of solid particles below their melting point. Shaping and firing take place together in this process. This method is used for producing dense pieces of refractory oxides and carbides.

(d) Slip Casting: In this process, a 30 to 40% suspension of ceramic material in water is poured into a porous mould, made up of plaster of paris, which sucks the water from the contact area. Thus a hard layer of clay is formed inside the mould. This process is repeated until the entire inner part of the mould gets filled. In this process certain blending agents such as finely ground quartz, deflocculants (to reduce the water content) such as Na_2CO_3, Na_3PO and Na_2SiO_3, etc are also added.

This method is used for producing white wares, chemical wares and porcelain materials.

Step 2 Drying

The moulded ceramic wares must be first dried carefully before firing. Direct firing of the shapes in the kiln results in cracking of the ware.

Step 3 Firing

The dried ceramic wares are fired at temperatures range from 700-2000°C to impart hardness, durability and strength. Unglazed ceramic ware is usually fired only once where as glazed ware is fired twice.