

Chapter1

Introduction

Mullite is a basic component of many aluminosilicate ceramics such as porcelains and stone ware. In nature, mullite is difficult to occur. Owing to its high temperature and low pressure formation conditions, it can be found in high temperature metamorphosis rocks. Mullite formation is also observed at the contact of alumina-rich sedimentary rocks with basaltic melt (Buchites or Sillimanite buchites) ⁽¹⁾

The outstanding properties of mullite are low thermal expansion, low thermal conductivity, excellent creep resistance, good chemical stability, suitable high temperature strength, good thermal shock resistance and good corrosion resistance, then it is a good candidate material for high temperature applications and also for composites.

Mullite has become a promising candidate material for substrate and packaging applications, optical tube, refractory such as kiln furniture, ceramic roller and thermocouple tube.

Mullite is typically synthesized from aluminosilicate materials; kaolinite is the most popular mixture between silica and alumina. There are also other various kinds of materials such as pyrophyllite, bauxite, sillimanite, quartz and sand. There are three different types of mullite based on the synthesis method.

- (1) Sintered mullite
- (2) Fused mullite
- (3) Chemical mullite (high purity mullite)

The mullitization temperature depends on the processing of the synthesis method and also starting materials. The range is from 1200 to 1700 °C. The mullitization temperature of chemical mullites such as those from sol-gel and precipitation methods are lower than sintered mullite and fused-mullite, because starting materials have very fine particles and high specific surface area. However the disadvantage of chemical-mullite is its high production cost in industrial scale.

This research is dealing with the synthesis of mullite by conventional method using low cost raw materials which have high specific surface area such as silica from rice husk and alumina from the waste of aluminum industry.

The objectives of this research are

- To synthesize mullite powder which is low in cost and mullitization temperature
- To produce mullite ceramic by the reaction sintering of the stoichiometric composition at temperature higher than the synthesis of mullite powder.