

## CHAPTER I

### INTRODUCTION

Rice husk is a by-product from rice production. Large quantity of the husk is produced annually. Around 5 million ton husk (22% of paddy) is utilized as a fuel for power plants and 1 million ton of its ash results [1]. The ash typically contains silica as high as 87-97% and small amount of alkalis and other trace elements [2]. Therefore, it is considered to be a silica source for synthesis of various compounds, e.g. pure silica [3, 4, 5], silica gel [6, 7], sodium silicate [8], silicon carbide [2, 9-15] as well as mullite. However, products readily to use made from rice husk ash are not yet widely developed.

The objective of this project is to develop structural ceramic products from rice husk ash for high temperature use. Waste sediment from the aluminum industry, which is a high purity source of alumina but low in cost, is added in different proportions to obtain the properties appropriate for specific applications.

Mullite is rare in nature, the most well known place of its occurrence being the island of Mull, UK. It is a chemically stable intermediate phase at atmospheric pressure in the silica and alumina system. Because of the significant properties: high strength at high temperature, low thermal expansion, good thermal shock resistance and good chemical stability, mullite is a strong candidate for low and high temperature applications. Mullite is regularly made of clay minerals such as kaolinite for refractory and kiln materials.

For the current research, the mullitization temperatures when different alumina sources, i.e. commercial alumina and waste from the aluminum industry, are applied will be studied. Proper weight ratio of rice husk ash and waste sediment ratio to produce mullite based crucibles will be investigated. Rheological properties, solids content and size of solids particles will be examined to estimate optimum conditions for

casting. Heat treatment conditions suitable for making crucibles will be determined. Green density, shrinkage, and properties of the fired products will be measured. The properties of the fired bodies will be compared with those of the commercial grade products.

It is beneficial to many sectors when products can be produced from low cost domestic materials. The rice husk ash, which is normally considered as waste and the waste from the aluminum industry can be utilized more efficiently. The products in custom designs can be made and delivered to users in a shorter time. Research, engineering and industrial work will be more supported. When the products are accepted in the market to some extent and large scale production is established, the wastes will be more value added and the large import quantities of the ceramic products for technical uses can be reduced.



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