CHAPTER 5: SUMMARY AND CONCLUSIONS

In the ceramic industry, many clay products are made to provide insulators to the electrical/electronic industries and for providing cutlery items. It is quite well known, China clay is popularly used in making these products. This particular China clay predominally contains Kaolinite clay mineral. It is well known, Kaolinitic Soil when it is mixed with water becomes a plastic material and can be conveniently moulded into any desired shape. These specimens moulded wet are kept for drying and subsequently fired to make the specimens strong and durable. Further, the finished product becomes insensitive to water.

The two important characteristics to be looked in are the plasticity during moulding and shrinkage during drying and firing. Kaolinite fits very well into this category. Unfortunately, the availability of this soil is confined to very few locations. In view of this, the necessity is felt to make use of locally available soils. In this thesis, the possibility of using two local clays from the outskirts of Kuala Lumpur is examined. The Soil-1 (PU3 clay) is having a very high plasticity and exhibits moderately high value of shrinkage. In an untreated condition, this soil cannot be used in ceramic industry. To reduce the plasticity and improve other soil properties, in the field of foundation engineering, there is a well known lime stabilization technique. By treating such soils with lime, the plasticity can be brought down to the convenient level and further shrinkage is vastly reduced. This technique is attempted and reported in this thesis.

In Chapter-2, a brief literature review has been brought out by many investigators who carried out extensive, testing on lime-treated clays. According to them, lime induces chemical reactions and as a result of it new cementation compounds like calcium silcate hydrate (CSH) and CAH and Tobermorite (Gel) are formed. These reaction products are identified using X-Ray Diffraction data and Scanning Electron Microscope (SEM).

In Chapter-3, the details of experimental work carried out are described. Two locally available soils are used in this investigation. An attempt has been made to reduce the shrinkage by using lime as additive. Conventional index property tests (Liquid limit, plastic limit and shrinkage limits) are carried out. The reaction products are identified using XRD and SEM. All the results are presented in Chapter-4. XRD and index properties indicate that Soil-1 and index properties indicate that Soil-1 comprises many swelling and shrinking minerals like montmorillonite, vermicullite etc. and plasticity index is 54% and shrinkage limit is 19%. For Soil-2, PI = 34% and shrinkage limit is 20%. By using 5% lime in these soils, in Soil-1 the plasticity index is reduced to 24% and shrinkage limit is increased to 28%. This reduction in plasticity and increase in shrinkage limit make the soil suitable for ceramic industry. Whereas in Soil-2, the treatment is not warranted. All the reaction products are identified using XRD and are reported in this chapter.

Cementation compounds could be seen from SEM micro-graphs.

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Based on this work, the following conclusions are drawn:

1. The possibility of any clay like locally available soils, PU3 clay and PTD clay, can be used in ceramic industry.

2. Soil-1 (PU3 clay) contains clays of high plasticity and high shrinkage. This soil in untreated conditions cannot be used in ceramic industry, whereas soil-2 (PTD clay) can be used in this type of industry without any treatment.

3. Treating the soils with lime alters the characteristics brings down the plasticity and shrinkage to controllable levels and with this treatment this can be used in ceramic industry.

4. The cementation compounds are identified using XRD Analysis and SEM.

SUGGESTIONS FOR FUTURE WORK:

This type of work can be extended for any types of Soils in Malaysia. Electrical Resistivity of treated Soil can also be studied and this will also add in furthering our knowledge in search of ceramic Materials.