

# CHAPTER I

## INTRODUCTION

### 1.1 Introduction

In some European countries, the temperature is very low in winter. Also there is a large temperature difference between day and night. Ice formation and frost heave cause millions of dollars of damage every year. (1) The heaving forces are amazingly large and can easily break foundations, pavements, sidewalks (2-3) and outdoor ceramic products such as brick, roofing tile and pottery. The physical fact is that (4-9) water in pores becomes ice after freezing and it expands about 9% in volume, and it decreases volume with rising temperature. The process generates a cyclic stress, If the pore is filled over 91% with water freezing causes deterioration of the matrix. Therefore, the outdoor ceramic products have to pass the frost test by freeze-thaw testing. (10-12)

This problem does not occur in Thailand but it is an important problem of outdoor ceramic exporter such as terra-cotta pottery product which is one kind of red ceramics. (13-14) The main composition is local red clay. (15) Red clay is composed of very fine particles and high ferrous oxide ( $\text{Fe}_2\text{O}_3$ ) content, but low content of fluxes. (16-18) Hence the fired product is high porosity, high water absorption about 14% and low relative density.

The scope of this research is to develop frost resistance property of terra-cotta pottery. One possible route is to decrease the porosity in sintered product which will lead to the decrease in water absorption by finding optimal process conditions.

## 1.2 The objectives

1. to improve frost resistance property in terra-cotta pottery
2. to study the effect of amount and particle size of sand and grog on physical properties and capillary pore volume of terra-cotta body
3. to study the effect of glass cullet on water absorption and capillary pore volume of terra-cotta body



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