Abstract

In Bangkok, the overwhelming amounts of seashell wastes are in excess of ten thousand tons every year. The disposal process of seashell wastes is mainly done through underground burial. Although seashell wastes can be utilized to produce lime by incineration furnace, this method poses detrimental threat to the earth atmosphere through generating substantial carbon dioxide gas (CO_2) pollution. The objective of this research is to study the utilization of seashell wastes disposal without harming the environment.

The study investigated the use of ground seashells including short-necked clam, green mussel, oyster and cockle for developing plastering cement suitable for general usage. This work was focused on the influence of variables on the properties of plastering mortar in accordance with the Thai Industrial Standard (TIS 1776–2542) compared with ordinary Portland cement (OPC) mortars. The parametric variables are the percentage replacement of ground seashells at the levels of 5%, 10%, 15% and 20% by weight of total binder. The properties studied were compressive strength, drying shrinkage, porosity and thermal conductivity. Also the study included the annual energy usages of air-conditioning for the computer modeled building with the ground seashell plastering mortars applied on the walls.

The results indicated that the amount of calcium carbonate ($CaCO_3$) are the main chemical component of ground short-necked clam shell, green mussel shell, oyster shell and cockle shell at the levels of 96.80%, 95.60%, 96.87% and 97.13% by weight respectively. The factors affecting the properties of plastering mortar were the fineness and percentage replacement of ground seashells. The increased amount of ground seashells caused the decrease in strength of plastering mortar, the decrease of water requirement and the increase of setting time for the mixture. For the drying shrinkage of mortar, using ground short-necked clam shell and ground oyster shell in the mixture caused the decrease in shrinkage of plastering mortar compared with an OPC mortar. For the porosity, the increased amount of ground seashells caused the

increase in porosity of plastering mortar, except the ground cockle shell mortar which provided the similar porosity. For the thermal conductivity, using ground seashells in the mortar mixture provided the lower thermal conductivity. The mortar mixture containing 20 percent of ground green mussel shell yielded the lowest thermal conductivity and saved the air-conditioning energy in the simulated buildings about 2.6% per year. In conclusion, all of the mortar mixtures containing ground seashells yielded the properties passing the TIS standards for plastering mortar.