Naphol Yoobanpot 2011: Development of Cementitious Materials using Industrial Wastes as Construction Materials. Doctor of Engineering (Civil Engineering), Major Field: Civil Engineering, Department of Civil Engineering. Thesis Advisor: Associate Professor Supakij Nontananandh, D.Eng. 247 pages.

The main objective of this research was to produce new cementitious material using combination of industrial wastes. The study purposed a guideline to design mix proportions derived from potential wastes based on chemical composition analysis and then compared with criteria to control overall properties of cement. It was also found that appropriate mix proportion, burning pattern and temperature, fineness of raw materials and cement and gypsum content were essential factors affecting properties of cement produced.

Experimental results showed that appropriate mix proportion which contained water supply sludge, waste limestone powder and ark shell within a rang of 20 - 25%, 25 - 50% and 5 - 75% could produce cements having major compounds such as C_3S, C_2S, C_3A and C_4AF comparable to those exist in OPC and having heavy metals lower than the allowable standard. Based on X-Ray Diffraction (XRD) analysis and Scanning Electron Microscope (SEM) observations, it was revealed that the produced cements possessed Hydration as initial reaction and Pozzolanic Reaction as long term reaction similarly to those found in OPC. In this study, a mixture of combined wastes such as water supply sludge, waste limestone powder ark shell and hydrated lime at a proportion of 25 : 50 : 5: 20 was selected as a representative of mix using burning rate 7 $^{\circ}$C/min. and a maximium temperature of 1,450 $^{\circ}$C to produce cement in order to perform physical property tests, study on strength of mortars and soil cement and relevant development mechanisms for evaluation of possible applications in civil and environmental engineering.

Based on the experimental results, mortars gained in strength with curing time, however, having relatively lower in strength than those of OPC mortars. In addition, the soil stabilized with a waste-based cement markedly gained in strength higher than those stabilized with OPC. Additionally, soil cement strength was found to increase with an increase in cement fineness due to rapid initial reaction of C_3A to form Calcium Aluminate Hydrate (CAH) and Ettringite, and consequent reaction of C_3S and C_2S to form Calcium Silicate Hydrate (CSH). The results of strength development in soil cement were agreeable with results of total suction measurements and observations on change on microstructures of the cement stabilized soils.

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