

Bunyarit Kongkeaw 2007: Sludge Based Geopolymer. Master of Engineering (Environmental Engineering), Major Field: Environmental Engineering, Department of Environmental Engineering. Thesis Advisor: Associate Professor Patcharaporn Suwanvitaya, M.Appl.Sc 85 pages.

Geopolymer has been developed as an alternative material to Portland cement, with the aim to reduce the carbon dioxide. It is the material resulting from polymerization of silica and alumina. Its production is based on the the reaction of sodium hydroxide, sodium silicate, and oxides of silica, alumina and calcium. These oxides can be found in many pozzolanic materials such as fly ash, metakaolin and blast furnace granulated slag.

In this study, sludge from Bang Khen water treatment plant was used to partially replace fly ash, the base material. Sodium hydroxide and sodium silicate were used as alkaline activator. The effects of the solution ratio, calcination temperature and the proportion of the calcined sludge were investigated.

It was found that the weight ratio of $\text{Na}_2\text{O} \cdot \text{SiO}_3$: NaOH of 1 yielded maximum compressive strength (524 ksc). In real conditions, 100% fly ash can achieve the compressive strength of 524 ksc. It was found that 20% replacement of fly ash by calcined sludge can also achieve the above strength with the burning temperatures of 650 and 800 °C. Even 30%-50% replacement of fly ash can be used in real conditions with a low compressive strength of about 300-500ksc. Of the three temperatures studies (500, 650 and 800 °C) 650 °C was found be optimum.

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Thesis Advisor's signature

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