

C7117803 MAJOR ENVIRONMENTAL ENGINEERING

KEYWORD: STABILIZATION/SOLIDIFICATION / HEAVY METAL SLUDGE /
LIGNITE FLY ASH / SODIUM SULFIDE / COD WASTEWATER /
HAZARDOUS WASTE

ANUWAT POONPHUNCHAI : SOLIDIFICATION OF HEAVY-METAL
SULFIDE SLUDGE USING CEMENT AND LIGNITE FLY ASH.
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This research investigates the stabilization of heavy metal sludge from COD wastewater treatment by adding sodium sulfide to heavy metal sludge before solidifying it with ordinary portland cement and lignite fly ash. The experiments were performed to determine not only the factors affecting the solidification process but also the physical properties of the solidified specimens, such as the compressive strength, density and permeability. In addition, the extraction tests on chromium, mercury and iron were carried out. The efficiency on leachability reduction and cost estimation for proper binders were also considered. There were four experiments in this research. The first experiment was carried out by varying the amount of sodium sulfide from 0 to 4.50 times stoichiometric of the concentration of chromium, mercury and iron in the sludge. The second experiment was performed by using the waste/cementitious binders ratios of 0.25, 0.35, 0.50, 0.60 and 0.70. The third experiment indicated the effects of varying curing time of the solidified specimens at 3, 7, 14 and 28 days. And the fourth experiment used the optimum conditions from the first and the second experiments to solidify heavy metals from the Samare-dum Industrial Waste Treatment Center.

The results indicated that the concentration of chromium and iron in the extracted solution was very low even if sodium sulfide was not added to the sludge. The stabilization efficiency of chromium and mercury, at a sludge/binders ratio of 0.25, was 60.01 and 91.40% for 1.75 times stoichiometric, respectively, while those of 3.00 times stoichiometric was 94.00 and 99.49%, respectively. The concentrations of both metals at these two sodium sulfide quantities were lower than the toxic substances standard promulgated by the Ministry of Industry, Thailand. Cost estimation of the treatment was about 5,000 baht per ton of sludge for 1.75 times and 5,790 baht per ton of sludge for 3.00 times while that of no sodium sulfide adding was about 3,900 baht per ton of sludge, but the concentration of mercury in the extracted solution was higher than the toxic substances standard (> 0.20 mg/l).

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