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PREPARATION OF POLY-SILICATE ALUMINIUM MAGNESIUM ZINC (PSAMZ) COAGULANT AND ITS APPLICATION FOR THE TREATMENT OF OILY SLUDGE

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Abstract

In the process of oily sludge conditioning centrifugal treatment, it is necessary to add high-effective conditioning agent for oily sludge conditioning. A new inorganic polymer coagulant, named poly-silicate aluminium magnesium zinc (PSAMZ) was prepared by using direct composite method with raw materials of sodium silicate, aluminium sulphate, magnesium sulphate and zinc sulphate. PSAMZ was applied for the effective conditioning–centrifugal treatment of oily sludge. The optimum preparation conditions of the coagulant were determined according to single factor and orthogonal experiment, in which the ratio of the number of various elements of PSAMZ was $n(\text{Zn}):n(\text{Si}):n(\text{Mg}):n(\text{Al})=3:1:0.66:0.33$, and the reaction temperature was set to 30°C. The property of the prepared PSAMZ was determined by infrared spectroscopy and XRD. Results showed that metal ions and activated poly-silicate can form new silicon aluminium magnesium zinc polymer through complexation, polycondensation and coordination binding. The experimental result of conditioning–centrifugal treatment of oily sludge showed that the dosage of coagulant was 70 mg/L, pH=9 and the oil removal rate of oily sludge can reach 81.18% under optimum treatment conditions, which were the stirring temperature was 30°C, the stirring time was 30 min, the centrifugation speed was 3400 r/min and the centrifugation time was 35 min. The results indicated that PSAMZ was an effective coagulant. Scanning electron microscopy analysis results showed that after the coagulant was added into oily sludge, its adsorption bridging, electric neutralisation and netting function can be fully exerted, thereby promoting the oil phase to separate from sludge. Thermogravimetric analysis showed that some crude oil and bound water were effectively removed from oily sludge.

Keywords: inorganic polymer coagulant, oil removal, oily sludge, poly-silicate aluminium magnesium zinc, PSAMZ

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