Preparation and characteristics of lightweight sludge ceramics by dehydrated sludge from dye intermediate processing wastewater treatment

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ABSTRACT

Lightweight sludge ceramics (LSC) manufactured by two kinds of clay and dehydrated sludge from 4,4’-diaminostilbene-2,2’-disulfonic acid (DSD acid) processing wastewater treatment (DSD sludge) were studied for the sludge treatment. The raw pellets were pre-heated at 400°C for 15.0 min and sintered at 1,150°C for 8.0 min, which was beneficial to produce LSC. The optimum DSD sludge addition rate was determined by the physical properties (bulk density, water absorption, grain density, and expansion ratio), and then toxic metal leaching properties and microstructure properties were characterized. The results indicated that clay with high content of Fe$_2$O$_3$ might be more suitable for ceramics preparation, lower bulk (627.00 kg m$^{-3}$), and grain density (1,280.00 kg m$^{-3}$), and higher expansion ratio (18.80 v/v%) could be obtained with the optimum DSD sludge addition rate of approximately 50.0 wt%. Toxic metal leaching test showed that LSC was nontoxic and would not cause secondary pollution to water environment when applied as fillers, and the sintered ceramics had rough surface and porous interior according to microstructure analysis. Therefore, LSC prepared in this study might be utilized as biological media in wastewater treatment, which could turn hazardous solid waste (DSD sludge) into useful materials.

Keywords: Dehydrated sludge; Lightweight; Ceramics; DSD acid processing wastewater

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