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研究报告

冯彬,陈萍,詹良通,林伟岸,占鑫杰.污泥-焚烧底灰混合固化配方及强度增长机理[J].环境科学学报,2016,36(2):590-598

污泥-焚烧底灰混合固化配方及强度增长机理

Optimal material proportion for co-solidification of sewage sludge and MSWI bottom ash and its strength promotion mechanism

关键词: [污泥](#) [固化](#) [垃圾焚烧底灰](#) [配方](#) [强度增长机理](#)基金项目: [国家自然科学基金资助项目\(No.51208470\)](#); [浙江省科技厅项目\(No.2013C33012\)](#); [苏州市科技计划项目\(No.SS20122\)](#)

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摘要: 污泥与垃圾焚烧底灰混合固化是一种以废治废的处置方式.针对水泥固化污泥早期强度高、石膏固化污泥后期效果好的特点,分别采用水泥、石膏、水泥+石膏为固化剂,和不同掺量的垃圾焚烧底灰,开展脱水污泥固化试验研究.对固化污泥的无侧限抗压强度、含水量、增容比、浸出毒性及COD、pH值进行了测试,并用扫描电镜分析了固化污泥微观结构的变化.测试与分析结果表明:脱水污泥的较优固化材料配方为100%垃圾焚烧底灰、25%水泥和25%石膏,固化污泥的强度和含水量满足填埋要求,且增容比小,浸出毒性大幅降低.固化污泥的早期强度主要来源于垃圾焚烧底灰的骨架作用和吸水作用,后期强度增长主要依靠固化剂的胶凝作用和垃圾焚烧底灰的火山灰作用;其中钙矾石的生成是固化污泥强度增长的重要因素之一.

Abstract: Co-solidification of dewatered sewage sludge and municipal solid waste incinerator (MSWI) bottom ash is an environmental friendly way of disposal. As cement and gypsum play a role in the early and later stage of solidification respectively, cement, gypsum, and their mixture were selected as hardener for the co-solidification of dewatered sewage sludge and MSWI bottom ash. Unconfined compressive strength, water content, volume change ratio, leaching toxicity, COD and pH were measured on the solidified sludge and SEM tests were carried out to investigate the microstructure of the solidified sludge. The following conclusions can be drawn from the experimental study. The optimal material proportion for the sludge solidification is 25% cement, 25% gypsum, and 100% MSWI bottom ash. With this material proportion, the strength and water content of the solidified sludge meet the requirement for landfilling, and the volume change ratio and leaching toxicity can be controlled at a low level. The gain in the strength of solidified sludge is resulted from the skeleton effect and water absorption of MSWI bottom ash at the early stage and from the hydration effect of hardener and the volcano ash effect of MSWI bottom ash at the later stage. Production of ettringite during the solidification is one of the important factors contributing to the strength promotion for the solidified sludge.

Key words: [sewage sludge](#) [solidification](#) [MSWI bottom ash](#) [material proportion](#) [strength earning mechanism](#)

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