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能源和环境工程

ZnAlLa类水滑石对污泥脱水液中磷酸根的吸附

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摘要

通过共沉淀法合成了ZnAlLa三元类水滑石，并考察了其结构特征和对磷酸根的吸附性能。结果表明，在保持类水滑石层状结构的条件下，La的适量掺杂可增强吸附剂对磷酸根的吸附。当Zn∶Al∶La摩尔比为2.00∶0.90∶0.10时，ZnAlLa类水滑石在24h内对污泥脱水液中磷酸根的吸附量为35.15 mg P·g^{-1}，比无La时的吸附量提高了41.9%。300℃焙烧处理后，ZnAlLa样品转化为亚稳态的复合金属氧化物，同时比表面积明显增加，其磷酸根吸附量约为焙烧前的1.48倍。ZnAlLa对磷酸根的吸附在pH变化及竞争离子存在时表现出较强的稳定性。该吸附剂对污泥脱水液中磷酸根的吸附符合假二级吸附动力学;吸附等温线表现为Langmuir型。

关键词

ZnAlLa类水滑石 污泥脱水液 磷酸根 吸附

分类号

Phosphate adsorption by ZnAlLa layered double hydroxides from excess sludge filtrate

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Abstract

A series of ZnAlLa layered double hydroxides (LDHs) were synthesized by the coprecipitation method，and their structure and phosphate adsorption capacities were studied.The results showed that the layered structure was maintained when a proper amount of La was added as a trivalent cation into ZnAl LDHs.At the Zn∶Al∶La molar ratio of 2.00∶0.90∶0.10，the phosphate adsorption by the obtained ZnAlLa LDHs in 24 h was 35.15 mg P·g^{-1}，which was 41.9% higher than that by the La-free LDHs.After calcination at 300℃，the ZnAlLa LDHs were transformed to metastable mixed metal oxides with a higher specific surface area.The phosphate adsorption by the calcined LDHs was 1.48-fold higher when compared with that by the raw material.The phosphate adsorption by the ZnAlLa showed a high stability against pH variation and competing ions in the solution.The adsorption kinetics followed a pseudo-second-order model and the isotherms were of the Langmuir type.

Key words

ZnAlLa layered double hydroxides excess sludge filtrate phosphate adsorption

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