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INVESTIGATION OF ANTIMONY ADSORPTION BY WASTE SLUDGE FROM THE WASTE ACID REGENERATION SYSTEM

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Abstract

The process and mechanism of adsorption of pentavalent antimony (Sb(V)) and trivalent antimony (Sb(III)) in water by desilicated sludge, a waste byproduct from the waste acid regeneration system in the iron and steel processing industry, were investigated. The sludge contained akaganeite (β-FeOOH), which effectively adsorbed Sb(III) and Sb(V) from wastewater. The adsorption of Sb(III) was attributed to inner-sphere complexation, with minimal influence from pH. In contrast, Sb(V) adsorption occurred via an outer-sphere adsorption mechanism. Acidic condition favored Sb(V) adsorption, while the adsorption rate decreased significantly with increasing pH. After adsorption, the final pH remained relatively stable at around 4.0 when the initial pH ranged between 5.0 and 9.0, due to acidification and protonation effect. Furthermore, the oxidation of Sb(III) to Sb(V) was observed during the adsorption process, indicating a significant transformation in the speciation of Sb.

Key words: adsorption, antimony, hydroxyl oxidize iron, oxidation

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