



Tohdite recovery from water by fluidized-bed homogeneous granulation process

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ABSTRACT

Fluidized-bed homogeneous granulation process (FBHGP) is an advanced process that can remove heavy metals in wastewaters by forming densified granules without using seed material. This investigation studies the aluminum recovery from water by FBHGP. The effluent pH (pH_e) was an essential factor in determining the efficacy of FBHGP in terms of Al removal (%) and granulation ratio (GR, %). The Al removal % that was achieved by the growth of aluminum oxide hydrate nuclei at $300 \text{ mg}\cdot\text{L}^{-1}$ with an influent molar ratio of $[\text{H}_2\text{O}_2]_{\text{in}}/[\text{Al}^{3+}]_{\text{in}} = 2.50$ was 99.12% at $\text{pH}_e = 9.0 \pm 0.2$. However, the GR of 96.47% that transformed the crystalline phase of granular pellets from aluminum hydroxide to aluminum oxide hydrate ($\text{Al}_{10}\text{O}_{15}\cdot\text{H}_2\text{O}$ -Tohdite) was confirmed by the X-ray diffraction analysis. An effective FBHG process ran under a supersaturation was close to the metastable region, as discussed by the evaluations of hydraulic conditions and supersolubility activities in the effluent. To conclude, a practical way of recovering aluminum from aqueous solution into a granule form and non-toxic compound of aluminum oxide hydrate was done.

Keywords: Tohdite; Fluidized-bed; Granulation; Supersaturation

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