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Evaluation of the microbial cell structure damages in alkaline pretreatment of waste activated sludge

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Abstract

This study investigated the damages of microbial cell structures, as well as the relationships between these damages and the release of cellular organic matter in the pretreatment of waste activated sludge (WAS) by using alkaline pretreatment as model. In the alkaline pretreatment of WAS, the most damage of bound extracellular polymeric substances (EPS), cell walls, cell membranes, and cell nuclei occurred at pH 11.5–12.0 (46.2%), pH 11.0–11.5 (27.3%), pH 9.0–10.0 (34.2%), and pH 11.5–12.0 (44.4%), respectively. The damage percentages of these cell structures in the pH stabilization stage were low because most of the damages occurred when the pH increased. The structural integrities of sludge microorganisms were all damaged in the pH increase stage. The damages of EPS, cell walls, and cell membranes were significantly correlated with the release of cellular organic matter, and these damages were necessary to release the cellular matter in WAS.

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