

Supercritical water gasification of sewage sludge in continuous reactor

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Abstract

In this study, a process for the continuous recovery of phosphorus and generation of gas from sewage sludge is investigated for the first time using supercritical water gasification (SCWG). A continuous reactor was employed and experiments were conducted by varying the temperature (500–600 °C) and residence time (5–60 s) while fixing the pressure at 25 MPa. The behavior of phosphorus during the SCWG process was studied. The effect of the temperature and time on the composition of the product gas was also investigated. A model of the reaction kinetics for the SCWG of sewage sludge was developed. The organic phosphorus (OP) was rapidly converted into inorganic phosphorus (IP) within a short residence time of 10 s. The gaseous products were mainly composed of H₂, CO₂, and CH₄. The reaction followed first order kinetics, and the model was found to fit the experimental data well.