A Novel On-Site System for the Treatment of Pharmaceutical Laboratory Wastewater by Supercritical Water Oxidation

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For the on-site treatment of laboratory waste, we have been developing a compact-sized reaction system for the treatment of laboratory wastewater using supercritical water oxidation (SCWO) technology. Pharmaceutical laboratory wastewater is one of the most difficult wastewaters to treat because of its high concentration of halogenated organic compounds. We proposed a new cascade process in which two reactors are consecutively combined, carrying out hydrolysis in the first reactor followed by SCWO in the second reactor, for the complete removal of halogenated organic compounds. Dichloromethane was chosen as a representative model of chlorinated compounds. There have been many previous studies on the hydrolysis of dichloromethane, which results in the coproduction of formaldehyde and HCl. However, there has been less investigation on the kinetics of formaldehyde oxidation in supercritical water. In this study, we focus on the oxidation of formaldehyde in supercritical water with and without a catalyst. As a result, formaldehyde can be completely decomposed at 400°C and 25 MPa within a very short contact time in a heterogeneous system with a MnO2 catalyst.

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