

HYDROTHERMAL OXIDATION OF 1-8 DIAZABICYCLO [5.4.0] UNDEC-7-ENE (DBU) AT SUBCRITICAL AND SUPERCRITICAL CONDITIONS.

Oluwaponmile Osibo¹, Yoshito Oshima², Regina Santos¹, Bushra Al-duri¹.

¹School of Chemical Engineering, The University of Birmingham, Birmingham, U.K. B15 2TT.

² Institute of Environmental Systematic Studies, Graduate School of Frontier Sciences, The University of Tokyo, 5-1-5 Kashiwanoha, Kashiwa-shi, Chiba 277-8563, JAPAN

¹Email: pxo184@bham.ac.uk

Wet air oxidation (WAO) and Supercritical water oxidation (SCWO) are two promising technologies for treatment of industrial effluent containing noxious compounds. 1,8-Diazabicyclo[5.4.0]undec-7-ene DBU is a stable, toxic, nitrogen containing heterocyclic organic compound which exists in wastewater from pharmaceutical, dye and cosmetic industrial processes. WAO and SCWO were investigated for the complete mineralisation of DBU. Initial DBU concentrations for both studies were between 1000 and 3000 ppm under ambient conditions.

Aqueous solutions of DBU were oxidised in a batch reactor at temperatures between 170 and 240°C and pressures from 40 to 100 bar. It was found that the highest temperature gives appreciable DBU and TOC conversion, of 87 and 73% respectively, after 90 minutes.

The SCWO experiments were performed in a continuous plug-flow reactor, between 400 and 450°C, at 250 bar, with residence time between 1-7 s. DBU was completely converted and 83 % TOC conversion was achieved at 450°C, after 7 seconds.

In both studies, final products and intermediates such as carbon dioxide (CO₂), Nitrogen (N₂), Ammonia (NH₃) were also detected.

Pseudo first order kinetics were used to describe the kinetic data and evaluate the reaction constants and energy of activation for both sets of data. In this work, both batch and continuous flow reactors have been used to compare the kinetics obtained for DBU oxidation at subcritical and supercritical conditions.