



Supercritical water oxidation of N-phenylglycinonitrile wastewater

J.M. Zhang^{a,c}, C.Y. Ma^{b,c,*}, F.M. Zhang^{b,c}, G.F. Chen^{b,c}

^aSchool of Environmental Science and Engineering, Shandong University, Jinan, China

^bSchool of Energy and Power Engineering, Shandong University, No. 17923, Jingshi Road, Lixia District, Jinan 250071, China

Tel. +86 0531 88399371; Fax: +86 0531 88395877; email: sdetechym@163.com

^cNational Engineering Laboratory for Reducing Emission from Coal Combustion, Shandong University, Jinan, China

Received 17 January 2012; Accepted 27 September 2012

ABSTRACT

N-phenylglycinonitrile wastewater was treated with supercritical water oxidation (SCWO), at temperatures ranging from 375 to 550°C, a pressure of 25 MPa, residence times ranging from 5 to 60 s, and initial reactant concentrations ranging from 2,400 to 24,400 mg O₂/L in terms of chemical oxygen demand (COD). Results showed that when the initial COD of the wastewater was low and the oxidant was abundant, the temperature and residence time had significant effect on COD removal, while the initial COD concentration and oxidant dose did not show significant effects. A global rate expression was regressed from the complete set of data. An assumed pseudo-first-order global rate expression was determined with activation energy of 52.9(±2.9) kJ mol⁻¹ and a preexponential factor of 3.6(±1.4) × 10² s⁻¹.

Keywords: N-phenylglycinonitrile; Chemical oxygen demand (COD); Supercritical water oxidation (SCWO); Pseudo-first-order global rate

*Corresponding author.