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KINETIC STUDY OF PHENOL REMOVAL FROM WASTEWATER OVER A 0.5% Pt/ γ-Al_2O_3 CATALYST IN A TRICKLE BED REACTOR

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Abstract

Catalytic wet oxidation (CWO) of phenol was studied in the present work. The effect of liquid hourly space velocity (LHSV), superficial gas velocity, reactor pressure, temperature and initial phenol concentration on phenols removal was investigated. Results showed that phenol conversion increased with increasing reaction temperature, reactor pressure, and superficial gas velocity of oxygen, yet it decreased with increasing (LHSV). The results exhibited that the highest phenol conversion of (67.47%) was obtained over 0.5% Pt/γ-Al_2O_3 at the studied reaction conditions (i.e., operating pressure = 0.6 MPa, operating temperature = 140^{o}C, LHSV = 4 h^{-1}, and gas superficial velocity = 0.169 m/s), with phenol concentration = 900 mg/L. According to the kinetic results, the reaction behavior was first order with respect to phenol concentration, (0.69) order with respect to oxygen and the activation energy was equal to (29.299) kJ/mol. Selectivity maps for concentration of intermediate compounds in reactor effluent were introduced which would be helpful for monitoring the reaction pathways of phenol oxidation.

Key words: 0.5%Pt/ γ-Al_2O_3 catalyst, catalytic wet oxidation, phenol removal, trickle-bed reactor, wastewater treatment

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