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Impact of Pulsing and Trickle Flow on Catalytic Wet Air Oxidation of Phenolic Compounds in Waste Water at High Pressure

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Abstract : Phenolic compounds are the most carcinogenic pollutants in waste water in effluents of refineries and pulp industry. Catalytic wet air oxidation is an efficient industrial treatment process to oxidize phenolic compounds into unharmful organic compounds. Mode of flow of the fluid to be treated is a dominant factor in determining effectiveness of the catalytic process. The present study aims to obtain a mathematical model describing the conversion of phenolic compounds as a function of the process variables; mode of flow (trickling and pulsing), temperature, pressure, along with a high concentration of phenols and a platinum supported alumina catalyst. The model was validated with the results of experiments obtained in a fixed bed reactor. High pressure and temperature were employed at 8 bar and 140 °C. It has been found that conversion of phenols is highly influenced by mode of flow and the change is caused by changes occurred in hydrodynamic regime at the time of pulsing flow mode, thereby a temporal variation in wetting efficiency of platinum prevails; which in turn increases and/or decreases contact time with phenols in wastewater. The model obtained was validated with experimental results, and it is found that the model is a good agreement with the experimental results.

Keywords : wastewater, phenol, pulsing flow, wet oxidation, high pressure
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