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Sulphide removal from petroleum refinery wastewaters by catalytic oxidation

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ABSTRACT

The catalytic oxidation of sulphides present in oil refinery wastewaters was investigated in the present study. The wastewaters were obtained from the wastewater treatment plant of the oil refinery in Matosinhos (Portugal), *Galp Energia*. Air, NaOCl and H_2O_2 were chosen as oxidants and Fe^{3+} and Mn^{2+} as the two catalysts to assess the effective combination of catalyst–oxidant for sulphide removal after oil separation in parallel plate interceptors. Primarily, air (oxygen) was used as the oxidant and the efficiency of two catalysts (Fe^{3+} and Mn^{2+}) for sulphide removal was evaluated. Experimental data suggested that Fe^{3+} catalysed sulphide removal in the presence of oxygen was more effective than Mn^{2+} catalysed reaction. In a subsequent study, oxygen was replaced by NaOCl and H_2O_2, and the potential of various catalyst–oxidant combinations, NaOCl + [Fe^{3+}], NaOCl + [Mn^{2+}], H_2O_2 + [Fe^{3+}], H_2O_2 + [Mn^{2+}], was assessed. The NaOCl + [Fe^{3+}] combination achieved the maximum sulphide oxidation. Pseudo-first-order and pseudo-second-order reaction models were fitted to the kinetic experimental data. The influence of temperature on the kinetic rate was also investigated.

Keywords: Oil refinery wastewater; Sulphide removal; Catalyst; Oxidation; Kinetics

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