

NiO-CeO₂ Nano-Catalyst for the Removal of Priority Organic Pollutants from Wastewater through Catalytic Wet Air Oxidation at Mild Conditions

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Abstract : Catalytic wet air oxidation (CWAO) is normally carried out at elevated temperature and pressure. This work investigates the potential of NiO-CeO₂ nano-catalyst in CWAO of paper industry wastewater under milder operating conditions of 90 °C and 1 atm. The NiO-CeO₂ nano-catalysts were synthesized by a simple co-precipitation method and characterized by X-ray diffraction (XRD), before and after use, in order to study any crystallographic change during experiment. The extent of metal-leaching from the catalyst was determined using the inductively coupled plasma optical emission spectrometry (ICP-OES). The catalytic activity of nano-catalysts was studied in terms of total organic carbon (TOC), adsorbable organic halides (AOX) and chlorophenolics (CHPs) removal. Interestingly, mixed oxide catalysts exhibited higher activity than the corresponding single-metal oxides. The maximum removal efficiency was achieved with Ce₄₀Ni₆₀ catalyst. The results indicate that the CWAO process is efficient in removing the priority organic pollutants from wastewater, as it exhibited up to 59% TOC, 55% AOX, and 54 % CHPs removal.

Keywords : catalysis, nano-materials, NiO-CeO₂, paper mill, wastewater, wet air oxidation

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