



Treatment of cotton printing and dyeing wastewater by supercritical water oxidation

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ABSTRACT

The cotton printing and dyeing wastewater obtained from a printing and dyeing mill was treated by supercritical water oxidation (SCWO) in a continuous-flow reactor. The experiments were operated between 400 and 600 °C, 25 MPa was selected as a suitable pressure, hydrogen peroxide (H₂O₂) was used as an oxygen source, and excess oxygen varied from 0 to 300%. The studies indicate that the total organic carbon (TOC) degradation efficiency is over 99.7% when the temperature increases to 600 °C at 300% excess oxygen. The influence of oxidants on TOC conversion is obvious at a lower temperature and then evidently weakens with temperature. The ammonia nitrogen (NH₃-N) removal by the SCWO reaction from the dyeing wastewater was also discussed. The result shows that a high temperature and the right amount of oxidizing agent are required to achieve a good effect on removing NH₃-N. A salt separator was applied for the separation of salts contained in the wastewater and to prevent the reactor block. The desalination rate of the separator during the SCWO reaction process was also discussed. The studies show that the removal efficiency of the total dissolved solids (TDS) can be up to 95.8% when the temperature reaches 647 °C. The TDS in effluent after treatment increases with initial TDS concentration rather than remaining unchanged at a certain temperature. It is probable that the changes of one or the total salt concentration in the salt solution influence the salt solubility in SCW, which results in the variations of the salt precipitation rate.

Keywords: Cotton printing and dyeing wastewater; SCWO; Thermal degradation; TOC; NH₃-N; Desalination

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