Hexavalent Chromium Reduction at the Polypyrrole-Coated 304-Stainless-Steel-Electrode in a Filter-Press-Type Reactor

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In this work, the reduction of Cr(VI) to Cr (III) in a filter-press-type electrochemical-reactor is studied. The working electrode within the reactor is a polypyrrole-coated 304-stainless-steel plate. The polypyrrole was electropolymerized via 40 cyclic-voltammetry cycles. The deposit was characterized by Fourier Transform Infrared Spectroscopy, Optical Microscopy and Scanning Electron Microscopy. The Cr(VI)-ions solution was recirculated within the filter-press-type reactor and its concentration was monitored via the 1,5-diphenylcarbazide colorimetric technique. It was proposed that the Cr(VI)-removal process consists of a mechanism combining ion transport between the solution stream and the electrode, and reduction of Cr(VI) at the electrode. A mathematical model was then derived to describe the Cr(VI) evolution within the solution stream, and at the PPY electrode-layer. The model was validated with experimental data.

Keywords: conductive polymers, ion exchange, reduction, water contamination, mathematical model.

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