[ENV02]
Treatment of hexavalent chromium using a galvanic flow cell with different flow configurations

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The conventional way to treat wastewater containing heavy metals is by precipitation with hydroxide. However, hexavalent chromium cannot be precipitated directly. It needs to be reduced to trivalent chromium before precipitation can occur. Studies on the reduction of hexavalent chromium to trivalent chromium using a galvanic electrochemical flow cell have been carried out. The galvanic flow cell consists of two compartments that are separated by a cation exchange membrane, Raipore 4010. Graphite sheet was used as the cathode and steel wool was used as the anode. The reaction between hexavalent chromium and iron is a spontaneous reaction. It does not require an external input of energy. Potassium dichromate solutions in sulfuric acid with initial concentrations ranging from 10 ppm to 500 ppm were used as catholyte and 1 M sodium chloride solution was used as anolyte. The effect of different flow configurations of the electrolyte flow in the cell on the percentage of hexavalent chromium reduced were studied. The different flow configurations studied included parallel flow cell, counter flow cell, recirculation flow cell and single-pass flow cell. The treatment of a sample of wastewater from an electroplating industry was carried out. Results showed a 73.6 % reduction of hexavalent chromium using the single-pass flow cell. With the recirculation flow cell, 28 minutes was required to reduce 500 mL of the wastewater sample to hexavalent chromium levels below the detection limit.