Waste Disposal with Electrografted Polymers

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Disposal of industrial liquid wastes containing heavy metals is of major ecological and economic importance. Current needs are clean and low cost processes able to go far beyond the current regulations and produce cleaner water without secondary effluents. This work aims to develop a device for decreasing the output concentrations of some toxic heavy metal ions (Cu, Pb,).

The basic process for disposal of heavy ions is precipitation by hydroxides. Absorption on ion-exchange resins is often necessary as completion treatment to match some specific regulation thresholds. That latter step produces large volumes of secondary effluents because of the necessary separation of the heavy metals from the resin and its regeneration . The ecological profit is thus low. We propose an alternative based on adsorption phenomena at surfaces and electrical control of the expulsion stage. Our final goal is to save or ideally to avoid chemicals at the expulsion (or regeneration) stage of the process.

Capture of heavy metal ions was performed on active filters made of a high specific area conducting surface (such as metallic woven cloths or carbon felts) covered by poly-4-vinylpyridine. That polymer, which was grafted and grown as a uniform and thin polymeric film on the metallic surface by electrochemical grafting, exhibits strong chelating properties for heavy metal ions. The true interfacial links between the polymer and the substrate allows chemical and mechanical stability suitable for technological processes. Moreover electrochemistry can be used for the expulsion step when chelating groups and redox groups are combined within the film. The expulsion under electrical control allows an obvious ecological profit by removing intermediate chemical agents and reducing the secondary effluents.