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ELECTROCOAGULATION SCALING-UP FOR REMOVAL OF TOXIC METALS, NAMELY Cr^{6+} AND Ni^{2+}

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Presented cotribution deals with application of electrocoagulation process for removal of Cr^{6+} and other toxic metals, namely Ni^{2+}, Zn^{2+}, Cu^{2+} and Mn^{2+} from contaminated groundwater on the site of former galvanization plant. The industrial effluent has pH ranging from 4.2 to 4.8; RAS (dissolved inorganic salts) is 2540 mg/L and conductivity 488 mS/m.

The optimization experiments were carried out with model effluents in semicontinuous arrangement (40 l/h), they revealed high efficacy in removals of Cr6+ together with its reduction towards Cr^{3+}, and total removal efficacy exceeded 90 %. It was shown that Al electrode was not suitable for Cr^{6+} reduction and removal because Al ions did not revealed reduction effects as Fe electrodes. That is due to Al electrode dissolution towards Al^{3+} whilst Fe is dissolved in form of Fe^{2+} that further oxidizes towards Fe^{3+} and this additional oxidation leads to reduction of Cr^{6+}. Experiments with industrial effluent revealed reduction in $Cr_{tot.}$ from 44 mg/L to 0.15 mg/L. Due to low pH, not all metals were removed with 90 %+ efficacy.

Quarter scale experiments were performed in continuous arrangement with a flowrate 100 l/h and iron electrodes. Treated water flew to a fast mixing tank (300 rpm), then slow mixing tank (20 rpm) and finaly to a sedimentation tank to separate sludge from treated water. Concentrated sludge was filtered through filterpress with an area of 0.5 m^2 and it was used for calculation of metallic balance. The sedimentation properties were improved with addition of anionic polymeric flocculant and, if needed, treated effluent was alkalized with $Ca(OH)_2$. Alkalization lead 99 %+ removal of all presented metals, not just chromium that was successfully removed without alkalization.

A continuous pilot scale unit (0.5 m^3/h) was fabricated based on obtained results and it was operated on contaminated industrial site. The removal efficacy of $Cr_{tot.}$ exceeded 99 % and removal efficacies of other metals were higher than 95 %. The concentrated sludge was filter-pressed and treated as a dangerous waste.

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