Effects of oxidation state of nickel (Ni), copper (Cu), palladium (Pd) and silver (Ag) on the rejection by nanofiltration membranes.

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Mining industry area comprises of many commodities and different production processes (Nie Yong Feng, 2005). Waste from the mine sector originates from mining operational discharge of metals (Copper, Nickel, Palladium and Silver) in solution from refinery plants into the river or nearby dams. Membranes have been used in the past for the recovery of metal in waste water effluents. Van der Merwe (1998) used the NF membranes and confirmed that the Cu^{2+} and Ni^{2+} large positively charged ions are rejected based on the molecular weight cut-off (MWCO) approximately 150-250 Daltons.

Qdais and Moussa reported that more than 90% of Cu^{2+} was removed by nanofiltration in the feed water. Lee *et al* (2008) reported that NF90 had high removal efficiency of ≥50% for Cu^{2+} and Ni^{2+} metals in the wastewater effluent from treatment plant. During the study of Ag^{+} metal, investigation was cancelled due to unreliable results (feed concentration was very low; RDS was high or below detection limit). Chilyumova and Jorg Thoming (2007) observed a higher retention about 95.3% and 99,82% at pH =2.4 and 94% and 99.85% at pH = 3.2 for NF and NF90 respectively for Ni^{2+} metal ion.

Membrane effective change and their isoelectric points were importantly considered. Among the NF elements used, NF90 was found to be the one that rejected the most compared to NF and NF270, with order NF270>NF>NF90 due to their pore size and surface charge. The study is aimed at evaluating the performance of a nanofiltration (NF) membrane for the removal/recovery of transition metals and the use of Donnan Exclusion mechanism for the ion separation from electrostatic interaction of cation metal. Flat sheets membranes (NF90, NF270 and NF) will be used for evaluation and rejection of cation on the surface layer of polymer material with the application of pressure as the driving force at 25°C. In this study, the use of pH meter will prioritize for the characterization of individual membrane charge (positively or negatively charged) and conductivity meter will be used for concentration of solution and the ion the content of the solution. AAS and ICP instrumentations will be used for quantification of metal cation species of the feed and the permeate and Scanning Microscope Electrode will also be used for membrane morphology.

References:

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