

## Removal of Chromium by UF5kDa Membrane: Its Characterization, Optimization of Parameters, and Evaluation of Coefficients

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**Abstract :** Water pollution is escalated owing to industrialization and random ejection of one or more toxic heavy metal ions from the semiconductor industry, electroplating, metallurgical, mining, chemical manufacturing, tannery industries, etc., In semiconductor industry various kinds of chemicals in wafers preparation are used . Fluoride, toxic solvent, heavy metals, dyes and salts, suspended solids and chelating agents may be found in wastewater effluent of semiconductor manufacturing industry. Also in the chrome plating, in the electroplating industry, the effluent contains heavy amounts of Chromium. Since Cr(VI) is highly toxic, its exposure poses an acute risk of health. Also, its chronic exposure can even lead to mutagenesis and carcinogenesis. On the contrary, Cr (III) which is naturally occurring, is much less toxic than Cr(VI). Discharge limit of hexavalent chromium and trivalent chromium are 0.05 mg/L and 5 mg/L, respectively. There are numerous methods such as adsorption, chemical precipitation, membrane filtration, ion exchange, and electrochemical methods for the heavy metal removal. The present study focuses on the removal of Chromium ions by using flat sheet UF5kDa membrane. The Ultra filtration membrane process is operated above micro filtration membrane process. Thus separation achieved may be influenced due to the effect of Sieving and Donnan effect. Ultrafiltration is a promising method for the rejection of heavy metals like chromium, fluoride, cadmium, nickel, arsenic, etc. from effluent water. Benefits behind ultrafiltration process are that the operation is quite simple, the removal efficiency is high as compared to some other methods of removal and it is reliable. Polyamide membranes have been selected for the present study on rejection of Cr(VI) from feed solution. The objective of the current work is to examine the rejection of Cr(VI) from aqueous feed solutions by flat sheet UF5kDa membranes with different parameters such as pressure, feed concentration and pH of the feed. The experiments revealed that with increasing pressure, the removal efficiency of Cr(VI) is increased. Also, the effect of pH of feed solution, the initial dosage of chromium in the feed solution has been studied. The membrane has been characterized by FTIR, SEM and AFM before and after the run. The mass transfer coefficients have been estimated. Membrane transport parameters have been calculated and have been found to be in a good correlation with the applied model.

**Keywords :** heavy metal removal, membrane process, waste water treatment, ultrafiltration

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