REMOVAL OF Ni(II) AND Co(II) FROM AQUEOUS SOLUTIONS USING CROSSLINKED MEMBRANES

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Clean water is the most essential element for the living organisms. Nowadays water resources are polluted by a large number of discharges from industrial and domestic sources, which make toxic effect on living organisms and ecosystems. The main industrial wastes are salts of heavy metals. Pollution of water by heavy metals is becoming a serious global problem. Membrane technology is considered to be one of the important wastewater treatment technologies. Adsorption and ion exchange methods are recognized as effective and economic methods to remove toxic metals from water solutions. Numerous examples of the synthesis of ion-adsorption and ion-exchange polymeric materials for the removal of heavy metal ions are presented in the scientific literature.

We have synthesized polymer membrane based on poly(2-acrylamido-2-propanesulfonic acid-co-acrylic acid-co-acrylonitrile) by UV-initiated radical polymerization. Similarly, a nanocomposite membrane was synthesized with the addition of a sol-gel system (SGS) based on tetraethoxysilane and 3-methacryloxypropyltrimethoxysilane. The ratio between monomers was AN:AMPS:AA = 60:30:10 (wt. %); SGS content in feed composition was 20 wt. %. IRGACURE 651 (2 wt. %) was used as a photoinitiator and N,N´-methylene-bis-acrylamide (3 wt. %) – as a cross-linking reagent.

The synthesized membranes were used to remove Ni(II) and Co(II)) from aqueous solutions of $Ni(NO_3)_2$ and $Co(NO_3)_2$ (50±0.05mg/L). The investigation of the removal capacity of the materials was performed using a spectrophotometer Spekol-11 (Fig. 1). The amount of the membrane in solution was 2±0.05g/L.

All synthesized membranes showed a high ability to remove Co (II) and Ni (II) (up to 70 %). The equilibrium of adsorption process was reached after 20 min. It was found that polymer/silica membranes have a greater ability to remove heavy metal ions compared to polymer ones.

The internal cross-sectional structure of the membrane (Fig. 2) after measuring the adsorption activity was evaluated using a scanning electron microscope PEMMA 102-02 with an X-ray microanalyzer system. The corresponding image of membrane cross-section demonstrates that heavy metals (Ni and Co) leaked over the entire thickness of the membrane.

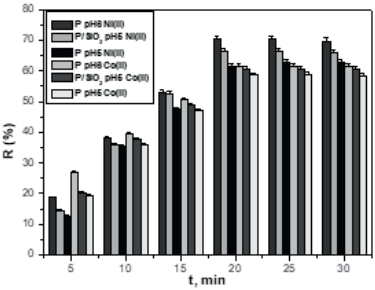

Fig. 1. Adsorption *vs* time

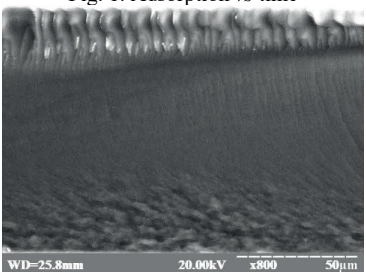

Fig. 2. Cross-sectional SEM image of membrane P/SiO_2 pH5 Ni (II)