

Nanocomposites and nanomaterials

Ceramic membranes with complexing groups in the surface layer

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One of the perspective methods for the removal of heavy metal ions from water is membrane separation [1,2]; therefore, a number of adsorptive polymeric membranes have emerged for such purpose [3]. However, inorganic membranes may have a range of advantages over polymeric ones [4]. Thus, the aim of the research was to develop advanced composite nano- and ultrafiltration ceramic membranes containing functionalized silica layers capable of selective binding of heavy metal ions from the surface and waste waters. The objects of the research were alumina supports, both, planar and tubular, with silica layers containing complexing groups (such as $(\text{CH}_2)_3\text{NH}_2$, $(\text{CH}_2)_3\text{SH}$, and $(\text{CH}_2)_3\text{NHC}(\text{S})\text{NHC}_2\text{H}_5$) deposited via the sol-gel method of alkoxysilanes co-polycondensation. The membranes were characterized with IR spectroscopy, BET analysis, SEM, contact angle measurements, and filtration experiments. SEM and FTIR studies confirmed the composition and morphology of the deposited layers. It was determined that the performance of the functionalized membranes depends on the degree of modification. All the membranes were tested for heavy metal ions retention from model solution, and their performance after several cycles of regeneration was analyzed.

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