

Physico-Chemical nanomaterials science

Composites of membranes and silica adsorbents for heavy metal ions removal from water

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One of the most common chemical pollutions is pollution with heavy metals. The search for more effective and energy efficient sorption technologies is still an urgent problem. The main index of the sorbent efficiency is the distribution coefficient [1], which depends on the nature of the functional groups and the stability of the complex. We synthesized silicas with ion-exchange groups via sol-gel and template methods, and combined them with the membranes using three approaches (as described in fig.1). Heavy metal ions solutions with initial concentrations of 0,0005 M were filtered through the obtained composites using the Amicon membrane cell (Fig. 1). As a result of the experiment, it was shown that the first approach allows removing 99% of ions. Extraction efficiency decreases during the following cycles, due to the saturation of the sorbent. The second approach provides 65% purification of water from heavy metal ions, and the extraction efficiency does not change during the following cycles. The third approach provides about 5% removal of ions during the first cycle due to the high water flow through the membrane and low concentration of functional groups.

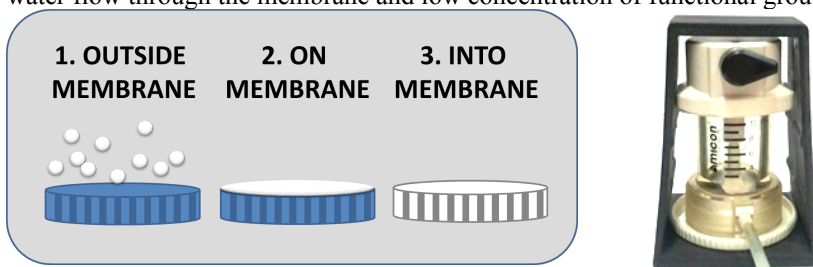


Fig. 1. Three ways of combining silica with the membrane and membrane unit.

1. *Wan Y., Shi Y., Zhao D.* Designed synthesis of mesoporous solids via nonionic-surfactant-templating approach // Chem. Commun.-2007.-9.-P. 897–926.