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Nanostructured Block Polymer Membranes as High Capacity Adsorbers for the Capture of Metal Ions from Water BRYAN BOUDOURIS, Purdue University, JACOB WEIDMAN, University of Notre Dame, RYAN MULVENNA, Purdue University, WILLIAM PHILLIP, University of Notre Dame —

The efficient removal of metal ions from aqueous streams is of significant import in applications ranging from industrial waste treatment to the purification of drinking water. An emerging paradigm associated with this separation is one that utilizes membrane adsorbers as a means by which to bind metal salt contaminants. Here, we demonstrate that the casting of an A-B-C triblock polymer using the self-assembly and non-solvent induced phase separation (SNIPS) methodology results in a nanoporous membrane geometry. The nature of the triblock polymer affords an extremely high density of binding sites within the membrane. As such, we demonstrate that the membranes with binding capacities equal to that of state-of-the-art packed bed columns. Moreover, because the affinity of the C moiety can be tuned, highly selective binding events can occur based solely on the chemistry of the block polymer and the metal ions in solution (i.e., in a manner that is independent of the size of the metal ions). Due to these combined facts, these membranes efficiently remove heavy metal (e.g., lead- and cadmium-based) salts from contaminated water streams with greater than 95% efficiency. Finally, we show that the membranes can be regenerated through a simple treatment in order to provide long-lasting adsorber systems as well. Thus, it is anticipated that these nanostructured triblock polymer membranes are a platform by which to obtain next-generation water purification processes.

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