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Nano carbon enabled adsorption and membrane separations

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In this paper we present the role of nanotechnology in diverse separations. Of particular interest are nanocarbons (NCs) such as carbon nanotubes (CNTs) and graphene. They have the potential to be the next generation high performance separation media with applications that include different types of sorbents and membranes. The research findings highlight NC hybrids as sorbents. NCs with appropriate surface modification with metals and metal oxides can provide a platform for developing excellent remediation tools that range from drinking water defluoridation to the removal of arsenic. A complimentary approach is the combination with polymeric materials to develop membranes which exhibit greater permeation rates and higher selectivity. For example, the incorporation of NCs in a membrane offers several advantages because there can be several alternate mechanisms of solute transport. The high aspect ratio and nano structuring dramatically increases the active surface area and mass transfer. The NCs serve as molecular transporters and increase partition coefficients; together these contribute to enhanced permeation. The incorporation of CNTs in the pores of membranes is presented for different types of separations that range from extraction to sea water desalination. In extraction and pervaporation of organic molecules, the NCs serve as nano sorbents that facilitate solute exchange leading to performance enhancementover conventional membranes. On the other hand in membrane distillation the NCs serve as selective transporters of water vapor which is used in applications such as waste concertation and sea water desalination.

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