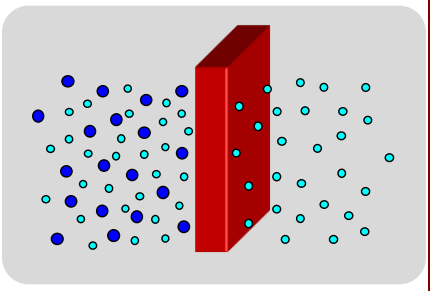
SAND2014-3397P

Exceptional service in the national interest

Sandia National Laboratories

Ion-Selective Materials for Heavy Metal/Radioactive Ground and Waste Water Cleanup

Improving water quality for re-use



Sandia-developed separations reduce the energy cost of cleaning water from industrial and natural pollutants.

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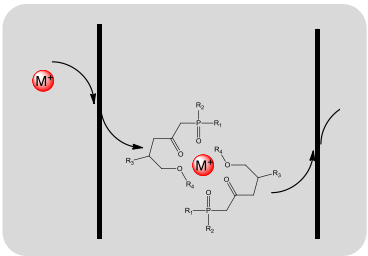
Problem Statement:

The "energy-water nexus" recognizes that the production of energy and clean water are dependent on each other. The energy costs required to remove heavy metals (As, Pb, Hg, etc.) and radioactive elements (^{131}I, ^{137}Cs, ^{91}Sr, etc.) to meet EPA maximum contaminant level (MCL) standards for clean water fall on industry and tax payers (as in the case of erosion of natural sources and degradation of manmade items). New methods are needed for heavy metal/radioactive separations from water.

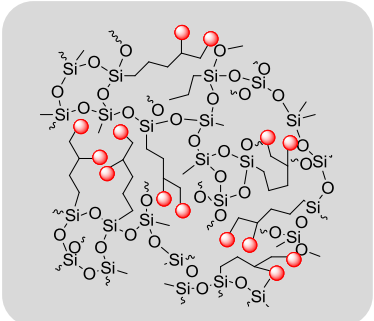
Approach:

Sandia's approach uses polymers and hybrid inorganic-organic materials for use as ion selective membranes and solid adsorbents. In membrane form, ion selective moieties attached to a highly durable polymer backbone allows targeted metal ions to "hop" across the membrane and concentrate on the permeate side for further processing or disposal. Hybrid inorganic-organic materials, such as functionalized alkylsilanes on silica or alumina, with ion selective moieties can act as robust solid adsorbents for cleanup of contaminated water. The solid adsorbents tightly bind metal ions to prevent leaching. Metal release from the adsorbent, if desired, is performed with a temperature or pH swing to regenerate the material.



Impact:

Sustainable access to clean water for human consumption and agricultural purposes is critical. The technology developed at Sandia National Laboratories decreases clean water scarcity and allows us to rapidly respond to events that threaten existing water sheds.



U.S. DEPARTMENT OF ENERGY | NNSA National Nuclear Security Administration

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