

PROTECTION - SCIENCE AND TECHNOLOGY ADVANCES FOR CHEMICAL AND BIOLOGICAL PROTECTION

Controlled Mass Transport In Highly-confined 1d And 2d Nanofluidic Material Platforms

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The ability to control and direct specific species transport across multiple scales is one of the fundamental goals for designing multifunctional materials for warfighter protection. Most of current man-made materials, however, lack the capability to facilitate selective and specific transport at a level that is competitive with the capabilities present in biological systems. Recent progress in materials science associated with development of 1D and 2D nanomaterials is beginning to offer some potential alternatives. In particular, precise control over molecular confinement, readily achievable in these materials, provides unique opportunities to enhance their separation performance and transport characteristics. I will discuss several examples of controlling ionic and molecular in highly confined 1D carbon nanotube porins and channels in layered 2D materials. I will also highlight some of the unusual mechanisms that enhance ion transport efficiency and ion transport selectivity in these systems, discuss the energy barriers for transport in these systems, and outline some challenges that we face in translating these unique transport properties into applications.

Parts of this work was supported as part of the Center for Enhanced Nanofluidic Transport (CENT), an Energy Frontier Research Center funded by the U.S. Department of Energy, Office of Science, Basic Energy Sciences under Award # DE-SC0019112. Work at the Lawrence Livermore National Laboratory was performed under the auspices of the U.S. Department of Energy under Contract DE-AC52-07NA27344.