

Abstract:

A novel 2-dimensional crystalline material composed of cyanide-bridged metal nanosheets has been developed. These materials, known as Hofmann clathrates, show strong potential for water purification and desalination by nanofiltration in reverse osmosis systems.

In this work, a series of dynamic molecular simulations will provide an understanding of the purification mechanism and performance estimates of the efficacy of this material for use as a desalination membrane. These computer models will be constructed using generally recognized force field models and iterative processes will provide an approximated assessment of the system parameters and physical limitations of the material.

A filtration membrane will be fabricated utilizing single layer crystalline sheets deposited on a macroporous substrate. This layer, composed of many platelets, will be deposited by sedimentation following exfoliation. Membrane thickness will be determined by scanning electron microscopy and atomic force microscopy. The membrane will be tested for form and function by forcing various aqueous solutions through it under pressure. The ability of the membrane to separate ionic species from the water, as well as, separations of trace heavy metals and some organic contaminants will be quantified. The operating pressures will be measured and reported. The decline of permeate flux as a function of membrane fouling will be investigated. The media will be tested in both dead-end and tangential flow filtration configurations. These tests will be carried out in the laboratory using a simple water pressurization system under various conditions. The performance of the membrane for limiting salt rejection under these conditions will be determined. A qualitative comparison of the experimental data and the computer model evaluation will be reported. A series of experiments will be conducted to determine the material's resistance to biofouling under typical operating conditions.

Biography:

Marcus Goss is a native Texan and grew up in San Marcos. He holds a Master's Degree in Chemistry from Texas State University. Marcus has been employed in numerous fields in science and technology. He is a veteran of the United States Air Force and has worked in communications, manufacturing, and materials science fields for over 15 years. After receiving his degree in 2005, Marcus joined Southern Clay Products, a subsidiary of Rockwood Specialty Chemical Company. There he served as a researcher in the advancement of R&D in elastomeric nanocomposites. In 2009, Marcus joined Systems and Materials Research Corporation in Austin, Texas. Marcus worked as a researcher in a variety of technical projects under SBIR /STTR funding for the Department of Defense. The underlying theme has been work on nanocomposite polymer applications. Marcus' career goals include founding, managing and selling technically oriented start-up businesses. He feels strongly that individuals should

diversify when it comes to life. He has always pursued what he enjoys. His hobbies include aviation, football officiating and performing live music.