Strong Enhancement of Nanoconfined Water Mobility by a Structure Breaking Salt

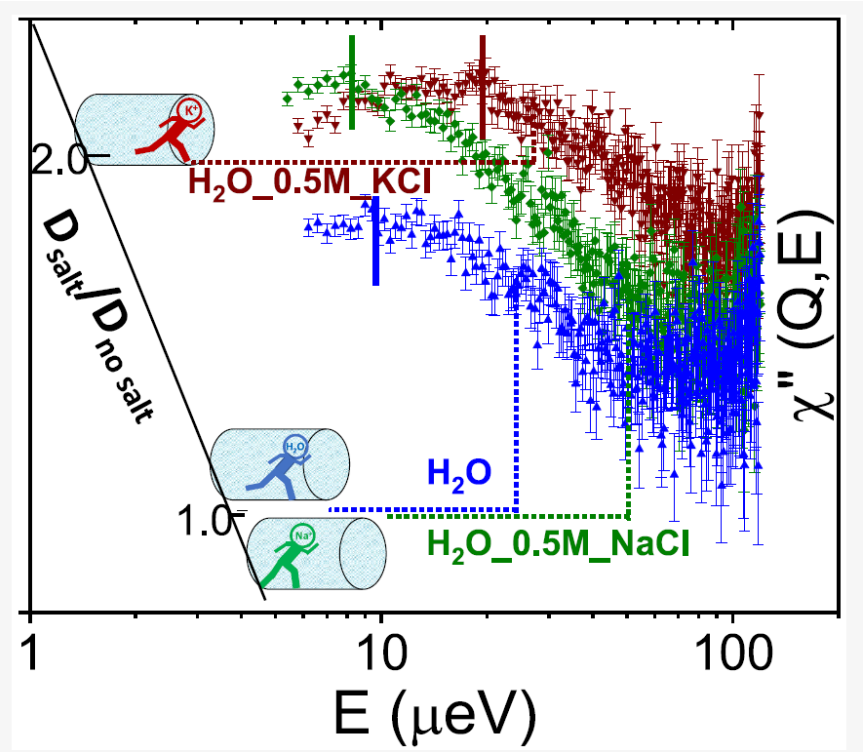

Figure 1. Dynamic susceptibility data generated from the corresponding QENS signal shows a shift of the peak maxima to the higher energy transfer in the MCM41_0.5M_KCl, indicative of a 2-fold increase in the diffusivity of water in confinement upon addition of KCl.

Work at SNS used BL-2 (BASIS)

N. C. Osti, B. P. Thapaliya, S. Dai, M. Tyagi and E. Mamontov, Journal of Physical Chemistry Letters, 12, 4038-4044 (**2021**). "Strong Enhancement of Nanoconfined Water Mobility by a Structure Breaking Salt".

Scientific Achievement

We investigated the diffusivity of water in aqueous solutions of chaotropic and kosmotropic ions confined in 3 nm MCM41 pores using elastic and quasielastic neutron scattering. There is a significant reduction of the average diffusion coefficient of water in aqueous salts solutions in confinement compared to that in the bulk solutions. Remarkably, the KCl solutions experience a cumulative impact of the confinement and the presence of K^+ ions, resulting in a 2-fold *increase* in the water diffusivity compared to pure water, or water with Na^+, in the same confinement.

Significance and Impact

A large increase in the water diffusivity, evident in the model-independent raw experimental data, should have important implications for the water/ion transport through the ion channels in biological membranes.

Research Details

Quasielastic neutron scattering (QENS) at BASIS and elastic neutron scattering (ENS) at HFBS were used to elucidate the dynamics of confined salt solutions.