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Studies of Water Diffusion on Single-Supported Bilayer Lipid Membranes by Quasielastic Neutron Scattering[1] M. BAI, A. MISKOWIEC, S.-K. WANG, H. TAUB, U. Mo, T. JENKINS, M. TYAGI, D. A. NEUMANN, NIST, F. Y. HANSEN, Tech. U. Denmark — Bilayer lipid membranes supported on a solid surface are attractive model systems for understanding the structure and dynamics of more complex biological membranes that form the outer boundary of living cells. We have recently demonstrated the feasibility of using quasielastic neutron scattering to study on a $\sim$1 ns time scale the diffusion of water bound to single-supported bilayer lipid membranes. Two different membrane samples characterized by AFM were investigated: protonated DMPC + D_2O and tail-deuterated DMPC + H_2O. Both fully hydrated membranes were deposited onto SiO_2-coated Si(100) substrates. Measurements of elastic neutron intensity as a function of temperature on the High Flux Backscattering Spectrometer at NIST reveal features in the diffusive motion of water that have not been observed previously using multilayer membrane stacks. On slow cooling, the elastic intensity shows sharp step-like increases in the temperature range 265 to 272 K that we tentatively interpret as successive mobile-to-immobile transitions of water bound to the membrane.

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