Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Changes in the Coherent Dynamics of Nanoconfined Room Temperature Ionic Liquids KEVIN VALLEJO, MELISSA CANO, The University of Texas at El Paso, SONG LI, State Key Laboratory of Coal Combustion; School of Energy and Power Engineering, Huazhong University of Science and Technology, GERNOT ROTNER, Oak Ridge National Laboratory, ANTONIO FARAONE, National Institute of Standards and Technology Center for Neutron Research, JOSE BANUELOS, The University of Texas at El Paso — Confinement and temperature effects on the coherent dynamics of the room temperature ionic liquid (RTIL) $[C_{10}MPy^+]$ $[Tf_2N^-]$ were investigated using neutron spin-echo (NSE) in two silica matrices with different pore size. Several intermolecular forces give rise to the bulk molecular structure between anions and cations. NSE provided dynamics (via the coherent intermediate scattering function) in the time range of 0.004 to 10 ns, and at Q-values corresponding to intermediate range ordering and inter- and intramolecular length scales of the RTIL. Pore wall effects were delineated by comparing bulk RTIL dynamics with those of the confined fluid in 2.8 nm and 8 nm pores. Analytical models were applied to the experimental data to extract decay times and amplitudes of each component. We find a fast relaxation outside the experiment time window, a primary relaxation, and slow, surface-induced dynamics, which all speed up with increased temperature, however, the temperature dependence differs between bulk and confinement. This study sheds light on the structure and dynamics of RTILs and is relevant to the optimization of RTILs for green technologies and applications.

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Date submitted: 13 Nov 2016 Electronic form version 1.4