

Abstract Submitted  
for the MAR14 Meeting of  
The American Physical Society

**Rotational and Translational Diffusion of Glass-Forming Ionic Liquids Confined in Nanoporous Silica** CIPRIAN IACOB, Penn State University, Department of Materials Science and Engineering, University Park, PA 16802 USA, JOSHUA SANGORO, University of Tennessee, Department of Chemical and Biomolecular Engineering, University of Tennessee, Knoxville, Tennessee 37996-2200, United States, JAMES RUNT, Penn State University, Department of Materials Science and Engineering, University Park, PA 16802 USA, FRIEDRICH KREMER, University of Leipzig, Institute of Experimental Physics I, Linnéstr. 5, 04103, Leipzig, Germany — Charge transport and glassy dynamics of several classes of ionic liquids confined in uni-directional nanoporous silica membranes are investigated in a wide frequency and temperature range by a combination of Broadband Dielectric Spectroscopy (BDS), Pulsed Field Gradient Nuclear Magnetic Resonance (PFG NMR) and Fourier Transform Infrared spectroscopy (FTIR). Two opposite effects are observed: (i) surface effects – resulting from strong interactions between the host system (nanoporous silica membrane) and the guest molecules (ILs) lead to slower dynamics – which are significantly reduced upon pore surface modification through silanization of the pores, and (ii) confinement effects – arising from spatial restriction of the molecules in nanometric length-scales – leading to enhancement of molecular dynamics. A model assuming a reduced mobility of the adsorbed layer at the pore wall/IL interface is shown to provide a quantitative explanation for the remarkable decrease of effective transport quantities (such as diffusion coefficient, dc conductivity and consequently, the dielectric loss) of the ILs in non-silanized porous silica membranes.

Ciprian Iacob  
Penn State University, Dept of Materials Science and Engineering,  
University Park, PA 16802 USA

Date submitted: 14 Nov 2013

Electronic form version 1.4