Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Decoupling of ionic conductivity from structural dynamics in polymerized ionic liquids 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, 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 structural dynamics in low molecular weight and polymerized 1-vinyl-3-pentylimidazolium bis(trifluoromethylsulfonyl)imide ionic liquids (ILs) are investigated by a combination of broadband dielectric spectroscopy, dynamic mechanical spectroscopy and differential scanning calorimetry. While the dc conductivity and fluidity exhibit practically identical temperature dependence for the non-polymerized IL, a significant decoupling of ionic conduction from structural dynamics is observed for the polymerized IL. In addition, the dc conductivity of the polymerized IL is found exceed that of its molecular counterpart by four orders of magnitude at their respective calorimetric glass transition temperatures. This is attributed to the unusually high mobility of the anions even at lower temperatures when the structural dynamics is significantly slowed down. A simple physical explanation of the possible origin of the remarkable decoupling of ionic conductivity from structural dynamics is proposed.

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