

Abstract Submitted
for the OSS10 Meeting of
The American Physical Society

Canopy Molecular Mobility in Nanoscale Ionic Materials¹ E. VON MEERWALL, Univ. Akron, M.L. JESPERSEN, P.A. MIRAU, R.A. VAIA, Air Force Research Labs, R. RODRIGUEZ, E.P. GIANNELIS, Cornell Univ. — Nanoscale ionic materials (NIMS) are useful organic-inorganic hybrids in which a core nanostructure is functionalized with a covalently attached corona and an ionically tethered bulky organic canopy. We have used NMR relaxation and pulsed-field gradient (PFG) diffusion experiments to measure the canopy dynamics of NIMS prepared solvent-free from 18-nm silica cores modified by an alkylsilane monolayer possessing terminal sulfonic acid functionality, paired with amine-terminated ethylene oxide/propylene oxide block copolymer canopy. Carbon NMR studies show that the block copolymer canopy is quite mobile both in the bulk and in the NIMS, and that the fast (ns) dynamics are insensitive to the presence of the silica nanoparticle. Canopy diffusion in the NIMS is slowed relative to the neat canopy, but not to the degree predicted from the diffusion of hard sphere particles. Canopy diffusion is not restricted to the surface of the nanoparticles and is unchanged by the addition of excess canopy. The data indicate that the liquid-like behavior in NIMS is due to rapid exchange of the block copolymer canopy between the ionically modified nanoparticles.

¹Supported in part by AFOSR, NSF-DMR, and King Abdullah Univ. Sci. Technol.

Ernst von Meerwall
Univ. Akron

Date submitted: 26 Mar 2010

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