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PEO mobility in nanoparticle-filled polymer electrolytes as measured by neutron scattering SUSAN FULLERTON, JANNA MARANAS, Penn State, VICTORIA GARCIA SAKAI, NIST Center for Neutron Research — The mobility of poly(ethylene oxide) [PEO] is measured for solid polymer electrolyte systems of PEO/LiClO4 and PEO/LiClO4/Al2O3, where LiClO4 is the lithium salt and Al2O3 is the nanoparticle filler. While the addition of nanoparticles has been shown to improve conductivity in solid polymer electrolytes, the molecular mechanism is unclear. Some suggest the addition of nanoparticles increases PEO mobility, while others suggest nanoparticles act like crosslinkers, pinning PEO at the ether oxygen atoms - decreasing PEO mobility. The glass transition temperatures of polymer electrolytes filled and unfilled with nanoparticles differs by only a few degrees, making it difficult to interpret the influence of nanoparticle fillers on PEO mobility. However, mobility can be directly measured by quasielastic neutron scattering, and has previously been used to measure a system of PEO/LiClO4. We measure PEO mobility using the High-Flux Backscattering Spectrometer [HFBS] and the Disk Chopper Time-of-Flight Spectrometer [DCS] at the NIST Center for Neutron Research in Gaithersburg, Maryland. The two techniques measure motion on a timescales ranging from 240 ps to 2 ns, and 0.1 ps to 40 ps respectively. PEO mobility is measured for filled and unfilled solid polymer electrolytes at 323K. The addition of LiClO4 imparts a second, slower process, and the addition of nanoparticle fillers increases PEO mobility.

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