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Direct Imaging of Nanoscale Ionic Clusters in a Polymer Electrolyte Membrane NITASH BALSARA, University of California, Berkeley, KENNETH DOWNING, SERGEY YAKOVLEV, Lawrence Berkeley National Laboratory — One of the factors hindering development of technologies such as fuel cells that rely on polyelectrolyte membranes (PEMs) is the lack of quantitative morphological characterization. While it has been recognized that clustering of ionic groups, can impede proton transport rates, model-free methods to quantify clustering in PEMs have not been developed. We present the first electron micrographs of sulfonic acid clusters in a polymer electrolyte membranes (PEM). The clusters are spherical with an average diameter of 1.4 nm and a standard deviation of 0.25 nm. Obtaining images of densely packed clusters of this size in a soft material is non-trivial due to their overlap in projection. Imaging of the sulfur-rich clusters by dark field microscopy was facilitated by the spontaneous formation of thin, cluster-containing layers on the top and bottom surfaces of free-standing films.

Nitash Balsara
University of California, Berkeley

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