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Effect of Pendant Side-Chain Sterics and Dipole Forces on Short Range Ordering in Random Polyelectrolytes[1] CHINOMSO NWOSU, University of Massachusetts, Amherst, TARA PANDEY, ANDREW HERRING, Colorado School of Mines, EDWARD COUGHLIN, University of Massachusetts, Amherst, UNIVERSITY OF MASSACHUSETTS, AMHERST COLLABORATION, COLORADO SCHOOL OF MINES COLLABORATION — Backbone-to-backbone spacing in polymers is known to be dictated by the length of the pendant side-chains. Dipole forces in random polyelectrolytes lead to ionic clusters with a characteristic spacing that can be observed by SAXS. Repulsion due to side-chain sterics will compete with dipole forces driving cluster formation in random polyelectrolytes. A model study on short range order in anion exchange membranes (AEMs) of quaternized P4VP-ran-PI is presented. Quaternization of P4VP with alkyl bromides having different numbers of carbons, C_nBr, introduces pendant side-chains as well as charges. X-ray scattering performed on PQ4VP-ran-PI(C_nBr) show that when $n<5$ the dipole forces dominate leading to the formation of ionic clusters. However, when $n>4$, the chains remain separated due to sterics, forming a distinct backbone-to-backbone spacing morphology. For n=3, both dipole clustering and backbone spacing can coexist. Crosslinking of the isoprene units increased the coexistence window from n=3 to n=6. Impedance measurements show that a maximum conductivity of 110mS/cm was obtained for PQ4VP-ran-PI(C_3Br). A discussion on short range order due to competition, or counter balancing, of steric repulsion and dipole forces will be presented.

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