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Comb-branched Polymer Electrolytes: Architectural Changes That Promote Increased Li$^+$ Transport ROBERT DEMILLE, Department of Chemistry, University of Utah, SOWMYA MURTHY, DMITRY BEDROV, GRANT SMITH, Department of Materials Science and Engineering, University of Utah — The use of solid polymer electrolytes (SPEs) in the batteries of next generation technology applications is promising due to their safety and stability, yet is also hindered by low conductivity and high temperature requirements. Recent simulations of comb-branched poly(epoxide ether)-based SPEs have shown the comb-branched architecture to be able to overcome some of these hindrances. While providing the advantage of preventing crystallinity and allowing the optimization of the backbone to be decoupled from that of the side chain, the comb-branched SPE studied suffers from slow Li$^+$ cation dynamics due to coordination with the backbone. To improve Li$^+$ transport, we have modified the architecture of the comb-branched poly(epoxide ether) by attaching the side chains to the backbone with non-coordinating, flexible spacers. Inclusion of these spacers has resulted in a five-fold increase in the diffusion of Li$^+$ cation effected through 1) an increased side chain flexibility, 2) a decreased interaction of the cation with the dynamically slow backbone, and 3) quick conformational dynamics of the entire side chain. Additionally we report on other desirable architectural changes, such as including carbonate solvating moieties, to comb-branched SPEs allowing enhanced mobility of Li$^+$.

Dmitry Bedrov
Department of Materials Science and Engineering, University of Utah

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