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Effect of Solvating Plasticizers on Ion Conduction of Polysiloxane Single-ion Conductors with Lithium Tetraphenyl Borate and Cyclic Carbonate Side Chains[1] U. HYEOK CHOI, SIWEI LIANG, Penn State University, MICHAEL O'REILLY, KAREN WINEY, University of Pennsylvania, JAMES RUNT, RALPH COLBY, Penn State University — We synthesize polysiloxane single-ion conductors containing two side groups: cyclic carbonates as a polar group and weak-binding tetraphenyl borate anions with Li^+ counterions as an ionic group. With increasing ion content, the ionomer T_g increases because of ion aggregation, making the conductivity drop greatly. To enhance segmental mobility and decrease the tendency for ion aggregation, this ionomer was plasticized with poly(ethylene glycol) (M_n = 600, PEG600) to various extents. The room temperature conductivity of the plasticized ionomer is 3 orders of magnitude higher than that of the neat ionomer. Addition of PEG600 increases ion mobility by lowering T_g and increases conducting ion content due to raising the dielectric constant. This suggests that PEG600 plays an important role by solvating Li^+ so as to lower T_g by dissolving ionic aggregates, consistent with X-ray scattering, which shows the ionomer aggregation peak decreases in intensity as PEG600 is added.

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