**Functional materials from living ring-opening polymerizations**

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The advent of living polymerization has enabled the development of novel materials with precise control over polymer architecture and functionality. In particular, the robustness of ring-opening polymerization methods has contributed to their popularity. Looking forward, continued innovation in both polymer design and polymerization methodology will broaden the impact of organic materials in addressing pressing real-world issues. Herein, we present two such developments that expand the toolbox of polymer synthesis and improve performance in membrane materials for chemical separations. First, we describe a platform for postpolymerization modification based on the living cationic ring-opening polymerization of a 2-alkylthio-2-oxazoline. The method enjoys mild activation and substitution conditions to access a diversity of polyureas and polythiocarbamates with broad functional group tolerance. Second, we use ring-opening metathesis polymerization to realize an alternative design strategy for microporous materials used in gas separation membranes, wherein the unique architecture of a flexible backbone with rigid, three-dimensional side chains engenders ultrahigh permeability and record stability at high pressure. Modifications in polymer structure and chemical functionality shed light on structure–property relationships and promise improved selectivity performance.