

Environmentally benign polymeric materials

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Abstract

Circulation of plastic materials has been one of the issues for a paradigm shift toward sustainable society. In this research group, the following two topics are focused: CO₂ capture by membranes and degradable polymers with low-temperature formability. Degradable block copolymers, derived from renewables and CO₂, show low-temperature formability through the application of pressure. This mechanism is explained by a pressure-induced phase transition from ordered (solid) state to disordered (melt/solid) state under pressurizing. The polymers not only reduce the required energy in molding with mitigating CO₂ emission, but also suppress polymer degradation with enhancing the recyclability. In this presentation, molecular design, chemical synthesis, material properties, and potential applications of those polymers will be introduced. In addition, effective carbon capture should be established in CO₂ capture and utilization, and membrane separation is expected to a next generation CO₂ separation technology in terms of energy-saving and cost effectiveness. While a number of membranes for CO₂ capture have been developed and developed, only a few research groups reached demonstration of the membranes. We have succeeded to prepare membrane modules for demonstrations, which exhibit world-top level gas transport properties. Recent results of CO₂ separation membranes are also discussed.

