Mechanically Robust Supramolecular Plastics by Desalting upon Liquid-liquid Phase Separation

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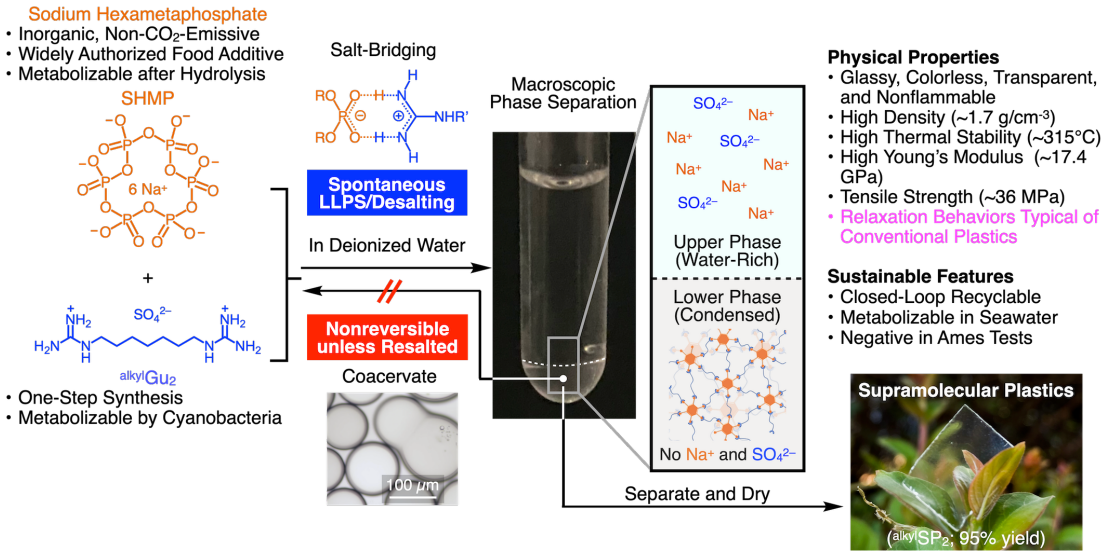
Microplastics, formed through the fragmentation of larger plastic debris, persist in oceans and pose long-term environmental hazards. Plastics that can metabolize in oceans are highly sought for a sustainable future.

In this work, we report the noncovalent synthesis of supramolecular plastics (SPs) that are mechanically strong yet metabolizable under biologically relevant conditions owing to their dissociative nature with electrolytes. Salt-bridging sodium hexametaphosphate with di- or tritopic guanidinium sulfate in water forms a cross-linked supramolecular network, which is stable unless electrolytes are resupplied. This unusual stability is caused by a liquid-liquid phase separation that expels sodium sulfate, generated upon salt bridging, into a water-rich phase. Drying the remaining condensed liquid phase yields glassy plastics that are thermally reshapable, such as thermoplastics.



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