Hygroscopic, ionically generated sulfur polymers

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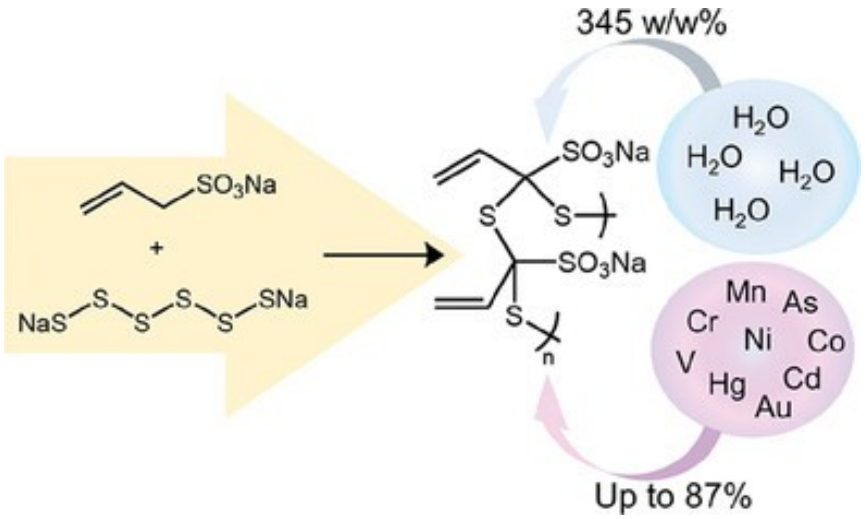
Sulfur is a waste product generated on the scale of 60 million tonnes per annum. Efforts to use this sulfur as a feedstock for functional polymer materials have resulted in the process of inverse vulcanisation and the products of this process. These polymers have been used in applications such as Li-S batteries, 2 mercury sequestration from wastewater, and as antibacterial surfaces. Problems arise in this process however, including polymer solubility in only organic solvents, the high temperatures (>120 °C) required for the synthesis, and the production of hydrogen sulfide as a by-product of the reaction. A new synthesis involving the nucleophilic decomposition of sodium polysulfides by a carbanion generated from the common surfactant sodium allyl sulfide yielded a linear polymer with exceptional water solubility. This polymer demonstrated a high capacity for atmospheric water harvesting with a capacity of 345 W/w%, and the ability to act as a flocculant to remove up to 87% of mercury ions from a 1 ppm solution.



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