Photopolymerized Superabsorbent Polymers Prepared From Bio-Resources

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Previous reports illustrate the feasibility of preparing superabsorbent polymers through a slow-pace and high-energy thermal polymerization process that utilizes petroleum-based monomers. Bio-monomers, such as Itaconic acid (IA), have been emerging due to their sustainability in response to recent climate change and environmental issues. This project explores the feasibility of superabsorbent polymer preparation through the superfast photopolymerization of bio-monomers such as IA. To maximize IA content in the final product, the solubility of solid IA in liquid dimethylacrylamide was examined. It was found that a clear monomer solution could be formed with an IA concentration as high as 33% by weight. Hydrophilic monomers N, N-dimethylacrylamide and 2-hydroxyethyl methacrylate, and bio-monomer IA were photopolymerized under ambient conditions utilizing phenylbis(2,4,6-trimethylbenzoyl)phosphine oxide as a photoinitiator in approximately one minute. Solid polymer beads have been prepared from different ratios of monomers, and their water absorbance was evaluated to confirm successful polymerization. The photopolymerization process and final polymers were characterized with Fourier-Transform Infrared Spectroscopy (FTIR), and Gas chromatography to further confirm successful polymerization. Polymer beads prepared with the super-fast photopolymerization technology in this study can absorb up to 356 times water of their dry weight. Moreover, the superabsorbent beads absorb much more water at high temperatures.

Awards Won:

Second Award of $2,000

YM American Academy: Third Award of $500.00