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Dr. Gretchen Peters

Department of Chemistry & Biochemistry
James Madison University
Harrisonburg, VA

Applications of boronic acids in soft materials and gels

The practical applications of soft materials and gels are wide-ranging and diverse. Because of this, there is an interest in developing materials that can be easily manipulated and optimized to fit a specific application. Furthermore, materials that respond to an external stimulus are particularly valuable. Boronic acids are useful additions to soft materials as they can both form crosslinks to induce gelation and introduce new function into the material. Here, we detail our exploration into the use of boronic acids in polymeric organogels, supramolecular hydrogels, and polysaccharide-based bioplastics. In one case, we have utilized the dynamic covalent interactions between boronic acids and diols to manipulate the properties of polyvinyl alcohol organogels and the binding potential of alcohol-rich plasticizers. In the other, we have introduced boronic acid handles into peptide- and cholesterol-based hydrogels as a means of targeting diol-containing drugs and aqueous pollutants. The versatility of boronic acids and their use in soft materials is extensive. These units can be readily incorporated into gels and bioplastics, and the resulting materials are promising for drug delivery and environmental remediation applications.