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Extended Abstract

Poly(2-isopropenyl-2-oxazoline) as a Versatile Platform for Multi-Functional Materials †

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Multifunctional materials are designed to meet specific requirements through tailored properties. Nowadays, there is a high demand for "smart" materials with integrated functionalities that make them responsive to multiple stimuli, switchable, and adaptive. [1] "Smart" or stimuli-responsive materials can alter their chemical and/or physical properties upon exposure to external stimuli. The development of specialized stimuli-responsive polymers with potential applications in harvesting the photomechanical energy, healable hard coatings, self-repellent surfaces, detecting, and sensing is witnessing exciting progress. [2] Recently, we developed an unprecedentedly versatile protocol to yield smart materials with promising potential as temperature sensors, [3] ophthalmologic biomaterials, [4] materials for detection and sensing applications, [5] and water purification materials. [6] The method is based on the ring opening addition reaction of poly(2-isopropenyl-2-oxazoline) (PiPOx), which is a hydrophilic and biocompatible polymer, with (di)carboxylic acids yielding polymeric materials with an esteramide structure. The key aspects that differentiate this work from other competitive studies is that the polymer modification reaction (or crosslinking reaction) is "clean" and does not require a catalyst, and that no by-products are formed. Due to these advantages, together with the wide range of available (di)carboxylic acids, we demonstrated that this protocol can be easily adapted to develop polymeric materials that respond to temperature, light, pH, amines, metal ions, and CO_2. Hydrogel materials have been developed via crosslinking with dicarboxylic acids with properties that can easily be tuned from soft, to ultra-tough or elastic, simply by altering the nature of the crosslinker, enabling their potential use as ophthalmologic to water purification materials.

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