# Tailoring SIPN hydrogels: a road into targeted multiresponsive actuation

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Semi interpenetrated network (SIPN) hydrogels offer a promising pathway to overcome the mechanical weakness of conventional hydrogels while preserving their high water uptake and biocompatibility. In this work, we designed a SIPN system by combining linear chains of hydroxyethyl cellulose with a covalently cross-linked poly (acrylic acid co 2 hydroxyethyl methacrylate) network. The resulting material exhibited enhanced mechanical robustness together with high pH responsiveness, porosity and cytocompatibility. As proof of concept, we evaluated the SIPN hydrogel performance in the context of oral drug delivery, using doxycycline hyclate as a model compound. The hydrogels achieved 82% encapsulation efficiency and enabled a sustained release up to 89% of the loaded drug under conditions mimicking gastrointestinal pH. Ongoing work focuses on integrating magnetic nanoparticles to develop a multiresponsive platform capable of targeted drug delivery, while maintaining the biocompatibility of the system.

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