

Stiff and tough bio-inspired hydrogels

Alvaro Charlet, Esther Amstad

Soft Materials Laboratory, Institute of Materials, Ecole Polytechnique Fédérale de Lausanne (EPFL), 1015 Lausanne, Switzerland

Hydrogels with well controlled and engineered properties are often used in biomedicine, for example for wound healing, or tissue engineering. Moreover, hydrogels with a very high toughness, that are well suited as soft dampers, can be fabricated if they are composed of polymer networks containing mixtures of covalent and non-covalent bonds. However, these hydrogels are typically elastic such that they cannot be used for load-bearing applications. Nature can produce hydrogels that are tough and yet sufficiently strong, that they can bear load. Inspired by the marine mussel, we investigate the influence of hydrogel networks containing transient and covalent bonds on their mechanical properties, as a function of their spatial distribution within the hydrogels. In this talk, I will present our approach to correlate hydrogel composition and their processing method, to their mechanical properties.