

Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Time-dependent Fracture Behaviour of Polyampholyte Hydrogels

TAO LIN SUN, FENG LUO, TASUKU NAKAJIMA, TAKAYUKI KUROKAWA, JIAN PING GONG, Hokkaido Univ — Recently, we report that polyampholytes, polymers bearing randomly dispersed cationic and anionic repeat groups, form tough and self-healing hydrogels with excellent multiple mechanical functions. The randomness makes ionic bonds with a wide distribution of strength, via inter and intra chain complexation. As the breaking and reforming of ionic bonds are time dependent, the hydrogels exhibit rate dependent mechanical behaviour. We systematically studied the tearing energy by tearing test with various tearing velocity under different temperature, and the linear viscoelastic behaviour over a wide range of frequency and temperature. Results have shown that the tearing energy markedly increase with the crack velocity and decrease with the measured temperature. In accordance with the prediction of Williams, Landel, and Ferry (WLF) rate-temperature equivalence, a master curve of tearing energy dependence of crack velocity can be well constructed using the same shift factor from the linear viscoelastic data. The scaling relation of tearing energy as a function of crack velocity can be predicted well by the rheological data according to the developed linear fracture mechanics.

Tao Lin Sun
Hokkaido Univ

Date submitted: 02 Nov 2016

Electronic form version 1.4