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Large-strain deformation and fracture of tough hydrogels REBECCA WEBBER, GUILLAUME MIQUELARD, COSTANTINO CRETON, ESPCI, JIAN PING GONG, Hokkaido University — Highly-swollen, chemically-crosslinked hydrogels generally behave in a very brittle manner, fracturing suddenly after a small amount of reversible deformation. Because of their importance as biomaterials, it is useful to control and augment the resistance to fracture of these materials. Tougher, stronger hydrogels are emerging, and it is important to understand the structural origins of strength in these relatively robust, highly-swollen, polymer systems. We have investigated the rheological, mechanical and fracture properties of tough hydrogels, using novel testing techniques and focusing on the high-strain compression and tension behavior. Results from large-strain and fracture experiments were correlated to the chemical structure of the hydrogels. Because we believe that the mechanical properties of these tough hydrogels are due to the presence of dissipative mechanisms at the molecular level, we have explored several methods of synthesis to create these materials.

Rebecca Webber
ESPCI

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