Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Block Copolymer-Based Supramolecular Elastomers with High Extensibility and Large Stress Generation Capability[1] ATSUSHI NORO, MIKIHIRO HAYASHI, Nagoya University — We prepared block copolymer-based supramolecular elastomers with high extensibility and large stress generation capability. Reversible addition fragmentation chain transfer polymerizations were conducted under normal pressure and high pressure to synthesize several large molecular weight polystyrene-b-[poly(butyl acrylate)-co-polyacrylamide]-b-polystyrene (S-Ba-S) block copolymers. Tensile tests revealed that the largest S-Ba-S with middle block molecular weight of 3140k achieved a breaking elongation of over 2000% with a maximum tensile stress of 3.6 MPa and a toughness of 28 MJ/m3 while the reference sample without any middle block hydrogen bonds, polystyrene-b-poly(butyl acrylate)-b-polystyrene with almost the same molecular weight, was merely viscous and not self-standing. Hence, incorporation of hydrogen bonds into a long soft middle block was found to be beneficial to attain high extensibility and large stress generation capability probably due to concerted combination of entropic changes and internal potential energy changes originaing from the dissociation of multiple hydrogen bonds by elongation.

[1]This work was supported by JSPS KAKENHI Grant Numbers 13J02357, 24685035, 15K13785, and 23655213 for M.H. and A.N. A.N. also expresses his gratitude for Tanaka Rubber Science Technology Award by Enokagaku-Shinko Foundation, Japan.

Atsushi Noro
Nagoya University

Date submitted: 08 Jan 2016 Electronic form version 1.4