Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Harnessing phase separation of tough hydrogel for optical modulation THANH-GIANG LA, XINDA LI, AMIT KUMAR, YIYANG FU, HYUN JOONG CHUNG, Univ of Alberta — Optically switchable materials, such as photo-electrochromic and liquid crystalline materials, has driven the advance of tunable optics devices. One interesting example is a reversible tuning of transparency that reflects electrical, thermal, or mechanical stimuli. Conventional materials the transparency tuning include electrochromic oxides (rigid, but dimensionally nonconformable) and liquid crystals (conformable, but must be encapsulated to prevent flowing). In our study, we developed a tough hydrogel based strategy to combine the merits of the rigid and the liquid materials. Here, soft polyampholytes (PA) hydrogel undergoes a transition between opacity and transparency at the upper critical solution temperature (UCST) due to its interaction with surround water molecules. In order to fine tune the UCST temperature in practically useful range (from 40 to 65 C), we adjusted the hydrophilicity/phobicity of PA by modulating monomer concentration when synthesizing the random copolymer. We discuss the origin of the phase behavior. In addition, we developed a stretchable, high-contrast, optically tunable stretchable window which consists of the PA hydrogel and a printed stretchable electric heater.

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Date submitted: 10 Nov 2016 Electronic form version 1.4