Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Super-Tough Hybridgels Comprising of Mesoporous Silica Microrods and Double-Network Polymers for On-Demand Drug Delivery by Mechanical Stimulation SUJI CHOI, YOUNGJIN CHOI, JAEYUN KIM, School of Chemical Engineering, Sungkyunkwan University (SKKU), Suwon 16419, Republic of Korea, NANOBIOMATERIALS LAB TEAM — Although hydrogels are useful for various industrial and biomedical applications such as drug/cell delivery, tissue engineering, and regenerative medicine, they have been often suffered from their weak mechanical properties. Over the past decades, a lot of strategies have been studied for overcoming the disadvantages of the conventional hydrogels. Here, we suggest a super-tough composite hybrid hydrogels (hybridgels) comprising of alginate/polyacrylamide double-network hydrogels embedded with mesoporous silica mocrorods (SBA-15). The super-toughness was attained from an efficient energy dissipation by multiple bondings between polymers and SBA-15. The superior mechanical properties of these hybridgels make it possible to maintain their structure for a long period of time in a physiological solution. Based on high mechanical stability, the hybridgels were demonstrated to exhibit on-demand drug release, which was controlled by an external mechanical stimulation. Moreover, different types of drugs can be separately loaded into the hydrogel network and mesopores of SBA-15 and can be released with different speeds, suggesting that these hydrogels could be used for multiple drug release.

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Date submitted: 06 Jan 2017 Electronic form version 1.4