

Abstract Submitted
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Design of biomimetic super-lubricants by hydrogel-biopolymer aggregates RAYMOND SEEKELL, RACHEL DEVER, YINGXI ZHU, University of Notre Dame — Inspired by the superb lubricity of natural synovial fluids for moving articular cartilage joints, we investigate a biomimetic artificial lubricant based on a hydrogel-biopolymer mixture with optimized rheological properties at a microscopic level. Specifically, we examine the structure and rheological relationship of stimuli-responsive poly (N-isopropylacrylamide) (PNIPAM) hydrogel added with hyaluronic acid (HA) to simulate the complexes of HA with a globule protein, lubricin, which are credited as the two key lubricious constituents in natural synovial fluids. By combined microscopic structural characterization and rheology measurement, we tune the rheological and frictional behaviors of HA solutions by optimizing the content of added micron-sized PNIPAM hydrogel particles to form stable PNIPAM-HA network. In a recent work on using zwitterionic hydrogel particles instead of negatively charged PNIPAM, comparable structure and rheological properties of hydrogel-HA aggregates are observed, which may give insight to design new biocompatible lubricants and lubricious coatings for medical ramification.

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