Stevens Institute of Technology

Nanotechnology Graduate Program

Mechanics of nanopottery and superwetting

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In the first part, I will talk about the mechanics of nanopottery. We show that a nanoscale polymer solution electrojet can coil to form free-standing hollow pottery as the jet is focused onto a sharp electrode tip. A scaling law is given based on the balance of the electrostatic compression force and the elastic resistance to predict the coil radius and frequency as the functions of relevant physical parameters. The structures formed by the nanofibers can be used in diverse fields of nanotechnology, for example, as nanomagnets, bioscaffolds, and nanochannels. In the second part, I will discuss the hydrodynamics of wetting of superhydrophilic micropillar arrays. Unlike a liquid drop that wets a smooth hydrophilic surface forming a thin lens, one on a rough hydrophilic surface penetrates into the gaps of asperities while its upper part slowly collapses. We show that the spreading of the upper part and the entire drop footprint follows a power law that is different from Washburn's law. This work can be used to understand various mundane and biological phenomena including writing with ink on paper and water transport in plants.

Professor Ho-Young Kim is associate professor of mechanical engineering at Seoul National University, Korea. He received his B.S. degree from Seoul National University, and M.S. and Ph.D. degrees from MIT. His research activities center around microscale fluid mechanics with particular interests in elastocapillary phenomena in natural and industrial situations and locomotion of aquatic animals. He is currently a visiting scholar at the Wyss Institute for Biologically Inspired Engineering, Harvard University. URL: http://fluids.snu.ac.kr.

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