Title: Wrinkling Labyrinth Patterns on Elastomeric Janus Particles

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Abstract: We describe a novel, low-cost and low-tech method for the fabrication of elastomeric Janus particles with diameters ranging from micrometers to millimeters. This consists of UV-irradiating soft urethane/urea elastomer spheres, which are then extracted in toluene and dried. The spheres are thus composed of a single material: no coating or film deposition steps are required. Furthermore, the whole procedure is carried out at ambient temperature and pressure. Long, labyrinthine corrugations ("wrinkles") appear on the irradiated portions of the particles' surfaces, the spatial periodicity of which can be controlled by varying the sizes of particles. The asymmetric morphology of the resulting Janus particles has been confirmed by scanning electron microscopy, atomic force microscopy, and optical microscopy. We have also established that the spheres behave elastically by performing bouncing tests with dried and swollen spheres. Results can be interpreted by assuming that each sphere consists of a thin, stiff surface layer ("skin") lying atop a thicker, softer substrate ("bulk"). The skin's higher stiffness is hypothesized to result from the more extensive cross-linking of the polymer chains located near the surface by the UV radiation. Textures then arise from competition between the effects of bending the skin and compressing the bulk, as the solvent evaporates and the sphere shrinks.

KeyWords Plus: Oil-Water Interface; Urethane/Urea Elastomer; Soft Matter; Spheres; Fabrication; Polymer

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