Capillary origami

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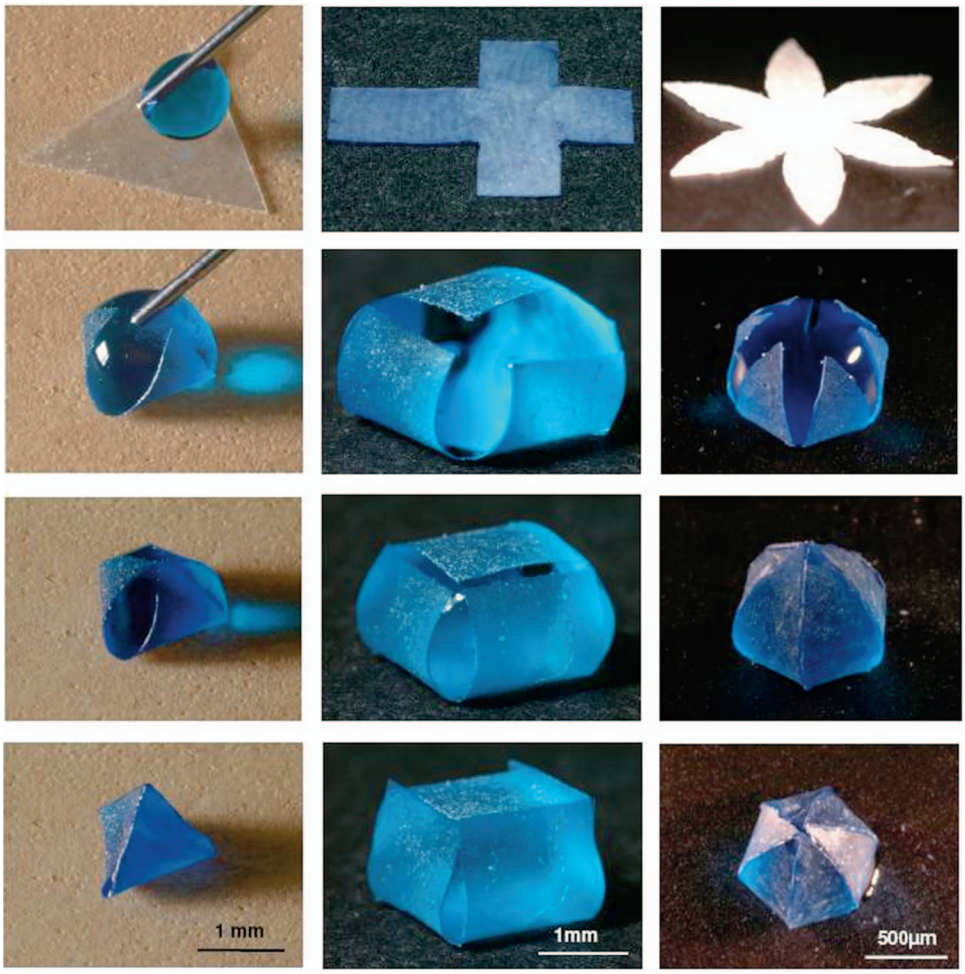

FIG. 1. (Color).

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The hairs of a wet dog rushing out from a pond assemble into bundles; this is a common example of the effect of capillary forces on flexible structures. From a practical point of view, the deformation and adhesion of compliant structures induced by interfacial forces may lead to disastrous effects in mechanical microsystems. However, capillarity may also drive the association of such microstructures into well-defined patterns. What happens when a water droplet is deposited on a flexible sheet? Does the sheet spontaneously wrap the droplet? Yes, if driving capillary forces overcome the elastic bending resistance of the sheet. The geometrical shapes obtained after a partial evaporation of the droplet are dictated by the initial cut of the sheet (see Fig. 1).[1] Pyramids, cubes, or quasispheres are obtained from triangles, crosses, or flower shapes, respectively. Beyond fundamental scientific interest (the problem is strongly connected with Gauss' classical theorema egregium on topology), we believe this capillary origami to be relevant for self-assembling three-dimensional microstructures from two-dimensional templates. At small scales, capillary forces indeed dominate over other interactions and minute droplets may serve as micropliers.

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[1]C. Py, P. Reverdy, L. Doppler, J. Bico, B. Roman, and C. N. Baroud, "Capillary origami: spontaneous wrapping of a droplet with an elastic sheet," Phys. Rev. Lett. **98**, 156103 (2007).

