Supporting Information of Letter:

Microorigami: Fabrication of Small, Three-Dimensional, Metallic Structures

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Experimental Details

Preparation of Glass Substrates. We cleaned glass microscope slides or glass capillaries (Pyrex, diameter ~1.7 mm) by immersing them in a piranha solution (concentrated H_2SO_4/30% H_2O_2 (3:1) – *Caution: piranha solution can react violently with organics and should be handled with care*) and then rinsed them with large quantities of distilled water and absolute ethanol. The slides were finally blown dry in a stream of filtered nitrogen.

Microorigami using Planar Substrates. Thin metal films – 50-nm-thick layers of silver with a 5-nm adhesion interlayer of titanium – were deposited onto clean glass microscope slides by electron-beam evaporation. Microcontact printing (μCP) of an alkanethiol "ink" with an elastomeric poly(dimethyl siloxane) (PDMS) stamp formed a patterned self-assembled monolayer (SAM) on the surface of the silver. The elastomeric stamps used to print the planar patterns were cast from photolithographically generated masters; the masters themselves were prepared using photomasks prepared on polymer films by high-resolution image setter. Immersion of the substrate for 60 – 80 s in an aqueous ferricyanide solution (0.001 M $K_4Fe(CN)_6$, 0.01 M K_3FeCN_6, 0.1 M $Na_2S_2O_3$) removed the areas of underivatized silver; immersion for 30 s in 1% HF solution removed the exposed titanium. Electrodeposition of a layer of silver (~25-μm-thick) onto the conductive metal pattern from plating bath at room temperature (Technic, Providence, RI, Techni-Silver E2) at a current density of ~20 mA/cm^2 strengthened the 2D structure. Weak adhesion between the evaporated and electroplated silver layers enabled mechanical separation of the 2D structure from the glass substrate. We introduced folds in the structure manually along perforated "hinges" using tweezers. Electrodeposition of nickel from a plating bath held at 40 °C (Technic, Providence, RI, Techni-Nickel-S) filled in the perforations between adjacent plates, effectively "welding" the structure into the final, 3D shape.

Microorigami using Cylindrical Substrates. Using an electron-beam evaporator, we coated a glass capillary (~1.7 mm diameter) with titanium (~5 nm, adhesion promoter) and silver (~50 nm). Two orthogonally rotating stages ensured that the entire surface of the capillary was evenly metallized. Microcontact printing of hexadecanethiol on the surface of the metal film was achieved by rolling the capillary across the surface of a poly(dimethyl siloxane) (PDMS) stamp "inked" with an ethanolic solution of hexadecanethiol. Careful alignment of the capillary with the stamp ensured that the printed pattern matched with an error of < 5 μm along the "seam." The SAM acted as a resist against subsequent wet chemical etching of areas of underivatized silver using an aqueous ferricyanide solution. A brief, subsequent etch in 1% aqueous HF solution removed exposed areas of titanium. Electrodepositing additional silver strengthened the patterned metal film. Dissolving the glass capillary in 49% aqueous HF solution (*Caution: the direct exposure of concentrated HF can result in damage to skin and bones*) released the freestanding, quasi-3D template. Crimping the cylinder along orthogonally oriented, perforated hinges using tweezers shaped the tetrahedra. The ends of the chain of tetrahedra were sutured together using a fine wire and welded by electrodeposition of an additional layer of silver (~50 μm) over the entire structure.