Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Origami folding of polymer sheets by inkjet printing YING LIU, BRANDI SHAW, MICHAEL D. DICKEY, JAN GENZER, North Carolina State University — In analogy to the ancient Japanese art of paper folding (Origami), self-folding is an attractive strategy to induce the formation of three-dimensional (3D) objects with well-defined shapes and dimensions using conventional two-dimensional (2D) patterning techniques, such as lithography and inkjet printing. Self-folding can be applied in the areas of reconfigurable devices, actuators, and sensors. Here we demonstrate a simple method for self-folding of polymer sheets utilizing localized light absorption on selected areas of the pre-strained polymer sheet. The ink is patterned via a desktop printer and it defines the location of the 'hinge' on the sheet. The inked areas on the 2D sheet absorb light preferentially, thus causing the polymer sheet to fold locally in the inked areas. The temperature gradients through the depth of the sheet induce localized shrinkage and the sheet folds within seconds. This patterned polymer sheets act as shape memory materials which can be programmed to fold into various 3D structures based on the nature of the light source, the shape and size of the ink patterns, and ink property. By controlling the aforementioned parameters we achieve a complete control of the time and degree of folding, which ultimately govern the final 3D shape of the folded object.

Ying Liu
North Carolina State University

Date submitted: 13 Nov 2014 Electronic form version 1.4