

Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Shape Changing Thin Films Powered by DNA Strand Exchange¹

TAE SOUP SHIM, ZAKI ESTEPHAN, ZHAOXIA QIAN, DAVID CHENOWETH, DAEYEON LEE, Univ of Pennsylvania, SO-JUNG PARK, Ewha Womans University, JOHN CROCKER, Univ of Pennsylvania — Active materials that respond to physical and chemical stimuli can be used to build dynamic thin-film micromachines that lie at the interface between biological systems and engineered devices. In principle, the specific hybridization of DNA can be used to form a library of independent, chemically driven actuators for use in such microrobotic applications and could lead to device capabilities that are not possible with polymer- or metal-layer-based approaches. Here, we report shape changing films that are powered by DNA strand exchange reactions with two different domains that can respond to distinct chemical signals. The films are formed from DNA-grafted gold nanoparticles using a layer-by-layer deposition process. Films consisting of an active and a passive layer show rapid, reversible curling in response to stimulus DNA strands added to solution. Films consisting of two independently addressable active layers display a complex suite of repeatable transformations, involving eight mechanochemical states and incorporating self-righting behavior.

¹DMR11-20901, NRF-2015R1A2A2A01003528, NRF-2016R1C1B2016089

John Crocker
Univ of Pennsylvania

Date submitted: 11 Nov 2016

Electronic form version 1.4