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Light-powered nanoparticle – MEMS hybrid EVGENIYA MOISEEVA, TOMAS LUCAS, GUANDONG ZHANG, ANDRE GOBIN, CINDY HARNETT, University of Louisville, ELECTRICAL AND COMPUTER ENGINEERING DEPARTMENT TEAM, BIOENGINEERING DEPARTMENT TEAM — This work presents a light-actuated microelectromechanical (MEMS) structure with bistable elements and its applications in cellular-scale actuation. These devices are built using a metal/oxide bilayer with a stress mismatch. In the hybrid design that uses gold nanoparticles for localized heating, a nanoparticle coating is patterned onto the selected part of the device by Parylene micro-stenciling before releasing the structures from the planar substrate. These gold nanoparticles are attractive for use in μTAS and biotechnology due to their biocompability and inertness, the ability to conjugate to the surface via thiol chemistry or electrostatic interaction, and especially their strong tunable absorption in the near infrared region. Integration of the near infrared (IR)-resonant gold nanoparticles with bistable MEMS structures creates light-driven hybrid actuators that quickly respond to narrow-band IR light. The movement of the MEMS device is achieved through controlled thermal expansion, with actuation speed in the millisecond range.

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