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Free-standing micro locomotive structures driven by the thermal modulation ONEJAE SUL, MICHAEL FALVO, LLOYD CAROLL, TIMOTHY O'BRIEN, RICHARD SUPERFINE, RUSSELL TAYLOR, JR., SEAN WASHBURN, Univ. of North Carolina at Chapel Hill, NANO SCIENCE RESEARCH GROUP (DEPT. OF PHYSICS AND ASTRONOMY, DEPT. OF COMP. SCI.) TEAM — As the sizes of Microelectromechanical(MEMS) devices and also the sizes of their contact to environment shrink down to micrometers, the role of contact becomes more critical in understanding and applying it for realization of mobile devices. Since the dominating forces between objects under micro regime are attractive forces such as van der Walls and capillary force, any motion will be mainly influenced by the surface forces rather than inertia. The greatest barrier to actuation is to overcome such forces while achieving net motion. This necessitates smallest contact area. Our research pushed the limits of the contact area to nanometers for minimized friction against the substrate, thus small friction requires lesser thrust and enables faster actuation. We made the inch-worm style bimorph thin film devices standing on the graphite and they are non-umbilical by design. We will first discuss the estimation of thrust, friction of a device on the graphite. We will then discuss the walking mechanism of coordinating three contact tips upon repeated heating and cooling thermal cycles. Additionally we will present predictions and measurements on various properties of our devices such as deflection depending on temperature, time constant of heat/cooling, and contact sliding speeds.

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