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## Metallic glass nanotube arrays: Preparation and surface characterizations

**Jem Kun Chen**

National Taiwan University of Science and Technology, China

In this study, we fabricated first-ever metallic glass nanotubes (MGNTs) in a distinct pattern on a Si substrate by sputter-depositing a coating of metallic glass (Zr<sub>55</sub>Cu<sub>30</sub>Al<sub>10</sub>Ni<sub>5</sub>) over a contact-hole array template created in photoresist. The resulting nanotubes were 500 or 750 nm in height with a diameter of 500 or 750 nm and wall thickness ranging from 44 nm to 103 nm. The structure of the nanotubes was preserved by the high strength and ductility of the metallic glass during the removal of the photoresist template under ultrasonic vibration. We observed an increase in the hydrophobicity of the MGNT with an increase in the thickness of the walls with the thickest walls presenting an apparent contact angle of 139°. The hydrophobicity is due to air trapped within the tubes which prevents the intrusion of water into the nanostructures. We also observed thermal-response behavior on the surface of the MGNT array. Surface cooling produced negative pressure within the nanochambers, which created a sucking force against the water droplets. Surface heating produced positive pressure within the nanochambers, which actually lifted the droplets. This thermal-response behavior was shown to be reversible for at least five cycles between 25 and 55 °C. The MGNT created adhesion forces reaching 14.2 Ncm<sup>-2</sup> which was sufficient to secure the water droplets even when the surface was tilted or completely inverted. The MGNT array in this study represents a biomimetic analogue with switchable contact interface, the behavior of which can be controlled simply by altering the surface temperature.

### Biography

Jem Kun Chen has pursued his PhD from National Chiao Tung University, Taiwan and Postdoctoral studies from Tohoku University, Sendai, Japan. He is the Professor of Materials Science and Engineering at National Taiwan University of Science and Technology. His current research emphasizes the nanoprocessing, nanocharacterization and optimization of polymer for optical and biological sensors. He has published over 129 articles.

jkchen@mail.ntust.edu.tw

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