Water Transfer Printing of Liquid Metal for 3D Flexible Electronics

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Abstract

Room temperature liquid metals (LMs) of Ga-based alloys are a kind of fascinating material possessing many excellent properties such as high conductivity, fluidity, deformability, nontoxicity and self-healing. Numerous efforts have been devoted to pattern LM on planar substrates to develop 2D flexible and stretchable electronics. However, the potential application of LM in 3D flexible and conformal electronics with enhanced component functionality is in its early stage. In this work, we report a simple and efficient method to transfer 2D LM patterns to nonplanar surfaces using the water transfer printing technique. LM was directly patterned on the water soluble film of polyvinyl alcohol (PVA) film using magnetic field, based on a novel LM patterning technique we developed previously.[1] As shown in Figure 1, after dissolving the film on the water surface, the LM patterns can be easily transferred to nonplanar surfaces by dipping the 3D objects into the water, or pulling them out of the water. We also demonstrated the applications of this technique for 3D flexible touch sensor and electronics skin.

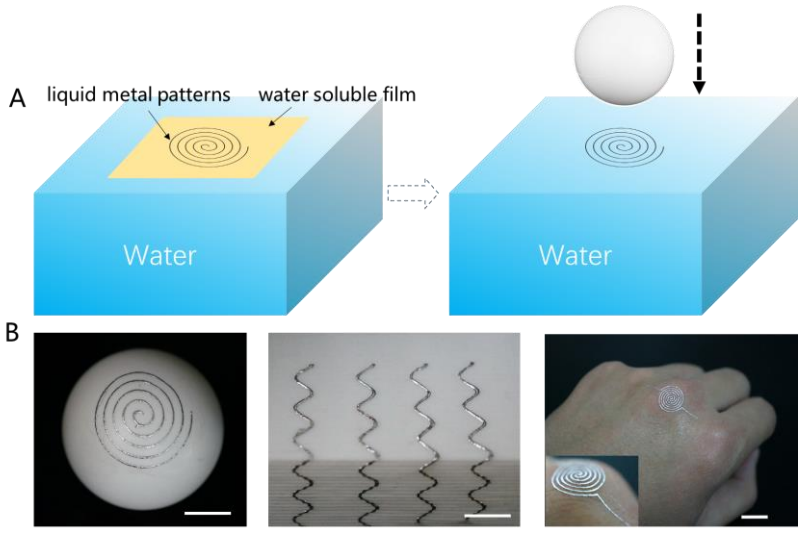

Figure 1: (A) Schematic illustration showing water transfer printing of liquid metal patterns to nonplanar surface for 3D flexible electronics. (B) Photographs showing the transferred liquid metal microstructures on different nonplanar surfaces. Scale bars: 10 mm.

References

[1] Ma, B., Xu, C., Chi, J., Chen, J., Zhao, C., Liu, H.: A Versatile Approach for Direct Patterning of Liquid Metal Using Magnetic Field. Adv. Funct. Mater. 2019, 1901370. https://doi.org/10.1002/adfm.201901370