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Liquid metal-based wireless sensor for human motion monitoring

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Abstract

Liquid metal based microfluidic device provides a promising way for wireless human signal monitoring, but the oxide layer formation on their surface, resist their applications. Here, we report a surface modified PDMS microchannel, by injecting Galinstan into the device, for wireless human motion monitoring. The PDMS microchannel is chemically modified using sulfuric acid (H₂SO₄) make the liquid metal flow easy without sticking to their surface and improve the non-wetting characteristics of Galinstan. We study the contact angle and behavior of Galinstan on untreated and sulfuric acid-treated flat PDMS surface. The electrical and mechanical properties of the surface-modified PDMS microfluidic device is studied to characterize the wireless communication of power and data. We demonstrate the wireless human motion monitoring of surface-modified PDMS microfluidic device by fixing it on the finger and wrist of the human body. The behavior of Galinstan, with high stretchability and bulk electrical conductivity, increase its use in various wireless human signal monitoring applications.

Keywords: PDMS microchannel, Surface treatment, Galinstan, wireless sensor, human motion monitoring.

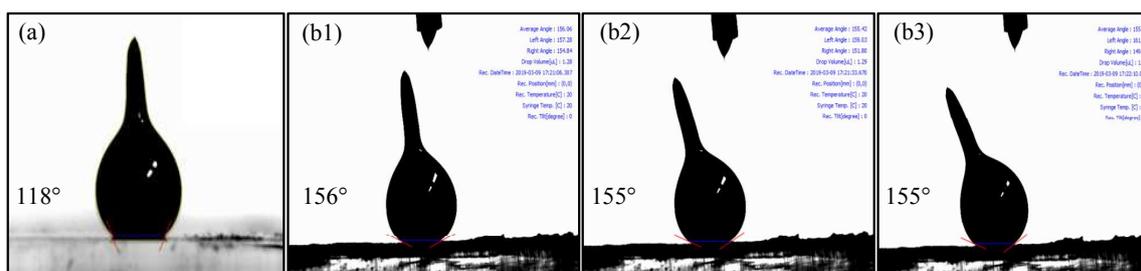


Figure 1. Behavior of Galinstan on untreated and sulfuric acid treated flat PDMS surface

References

- [1] G. Li, M. Parmar, and D. W. Lee, "An oxidized liquid metal-based microfluidic platform for tunable electronic device applications", *Lab Chip.*, Vol. 15, No. 3, pp.766-775, 2015.
- [2] M.D. Dickey, "Emerging applications of liquid metals featuring surface oxides", *ACS Appl. Mater. Interfaces.*, Vol. 6, No. 21, pp.18369-18379, 2014.
- [3] K. Khoshmanesh, S. Y. Tang, J. Y. Zhu, S. Schaefer, A. Mitchell, K. Kalantar-Zadeh, and M. D. Dickey, "Liquid metal enabled microfluidics", *Lab Chip.*, Vol. 17, No. 6, pp.974-993, 2017.

- [4] Y. R. Jeong, J. Kim, Z. Xie, Y. Xue, S. M. Won, G. Lee, S. W. Jin, S. Y. Hong, X. Feng, Y. Huang, and J. A. Rogers, “A skin-attachable, stretchable integrated system based on liquid GaInSn for wireless human motion monitoring with multi-site sensing capabilities” *NPG Asia Mater.*, Vol. 9, No. 10, pp. e443, 2017.
- [5] G. Bo, L. Ren, X. Xu, Y. Du, and S. Dou, “Recent progress on liquid metals and their applications”, *Adv. Phys.*, Vol.3, No.1, pp.1446359, 2018.

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