

High performance active smart sensors and their applications

Haixia (Alice) Zhang, Dr. Professor

School of Integrated Circuit, Peking University, Beijing, China

E-mail: hxzhang@PKU.edu.cn

<http://www.alicewonderlab.com/>

Abstract

The field of stretchable electronics has been developed rapidly in recent years due to their potential importance in diverse fields. Although the development of functional materials and flexible microsystems has been significantly advanced over the past decade, the precise control of soft structures remains a major challenge for practical applications of energy harvesting, functional sensing and interaction. Magnetic material is an attractive candidate that enables multifunctional devices with capabilities in both sensing and actuation.

In this talk, we show that magnetic materials with temporary magnetization can also achieve programmable, multimodal locomotion through a set of judiciously engineered 3D designs. Such 3D soft structures can exhibit various tethered locomotion under the precise control of magnetic fields, including local deformation, unidirectional tilting and omnidirectional rotation. Applications will focus on energy harvesting systems, including a 3D piezoelectric device for non-contact conversion of mechanical energy and active motion sensing, as well as a 3D magnetic-controlled solar cell that automatically tracks the light through continuous and accurate rotation. The design strategy and resulting magnetic-controlled 3D soft structures hold great promise not only for enhanced energy harvesting, but also for multimodal sensing, robotic interfaces, and biomedical devices through further encapsulation.



Bio

Dr. Haixia(Alice) Zhang, Professor, School of Integrated Circuit, Peking University. Dr. Zhang received her Ph.D. degree in Mechanical Engineering from the Huazhong University of Science and Technology at 1998. After finishing her postdoctoral research at the Tsinghua University during 1999-2001, she joined Peking University at 2001. From 2004 to 2006, she was a visiting

ng professor at the University of California, Davis/Berkeley and the Case Western Reserve University. Dr. Zhang is active in the field of micro and nanotechnologies with a focus on micro energy devices and smart system. She is Editorial board member of IEEE-JMEMS, IEEE-TANO, Microsystems & Nanoengineering, IET MNL, etc. She is co-author of 300 peer-reviewed scientific publications and 9 books/book chapters, co-invented 42 patents (include 5 US patents). She is the General Chair of IEEE MEMS2021, IEEE NEMS2021, and served as organizing chair of Transducers2021 Beijing, the Distinguished Lecture of IEEE Sensor Council during 2023-2025. She is the founder of **iCANX Talks**.

Dr. Zhang won National Invention Award of Science & Technology at 2006, Education Award at 2013 and 2017 in Beijing City, Geneva Invention Gold Medal at 2014. She was honored as the Excellence Teachers in Beijing at 2017, Top10 supervisors in Peking University at 2017. She won the Medal of May Day in 2018. She won the 2nd prize of National Education Award 2018 and elected as the member of Innovation Education Committee in Chinese Ministry of Education at 2018. She was listed in Forbes Top 50 Female Scientists at China in 2020, Nano Energy Award 2021, 2022年Elsevier Most Cited Chinese Researchers, 2023-2025 IEEE Distinguish Lecturer.