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Topic of the Speech:

Flexible and Wearable Acoustofluidic Biosensing Platform Based on Thin Film Piezoelectrics with Human-Machine Interactions

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Professor Yongqing Fu is a professor in the Faculty of Engineering and Environment, University of Northumbria at Newcastle, UK. He obtained his PhD degree from Nanyang Technological University, Singapore, and then worked as a Research Fellow in Singapore-Massachusetts Institute of Technology Alliance, and a Research Associate in University of Cambridge. He was a lecturer in Heriot-Watt University, Edinburgh, UK, and then a Reader in Thin Film Centre in University of West of Scotland, Glasgow, UK, before moving to Newcastle, UK in 2015.

He has extensive experience in smart thin films/materials, biomedical microdevices, energy materials, lab-on-chip, micromechanics, MEMS, nanotechnology, sensors and microfluidics. He has established a worldwide reputation from his pioneer research work on shape memory films, piezoelectric thin films, nanostructured composite/films for MEMS, sensors/ actuators, and renewable energy applications.

He published over 450 science citation index (SCI) journal papers (including Nat. Comm., Prog. Mater Sci, Adv. Mater., ACS Nano, Adv. Sci., Nano Energy, Nano Lett., Mater Horizons, Small, Chem. Mater., J Mater Chem A, Advanced Drug Delivery Review, Renewable and Sustainable Energy Reviews), two books, 20 book chapters, and over 120 conference papers. His current SCI H-index is 58 with over 15 K citations, and his Google scholar H-index is 68 with over 20K citations (up to March 2022). He is associate editors/editorial board members for seven international journals including Scientific Report. He is regular journal paper reviewers for more than 40 journals, has co-organized 12 international conferences worldwide, and co-edited six special issues for different journals.

ABSTRACT SUBMISSION
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B Flexible and Wearable Acoustofluidic Biosensing Platform Based on Thin Film Piezoelectrics with Human-Machine Interactions

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ABSTRACT (NO MORE THAN 500 WORDS:)

Flexible human-machine interface shows broad prospects for the next-generation flexible or wearable electronics, in comparisons with currently available bulky and rigid counterparts. However, most of these reported flexible devices (e.g., wearable lab-on-chips, flexible loudspeakers and microphones) show inferior performance compared to their rigid counterparts, mainly due to the nature of their flexibility. Therefore, it is of great significance to improve their performance by developing and optimizing new materials, structures and design methodology. In this paper, a flexible acoustic platform based on zinc oxide (ZnO) thin film on aluminum foil substrate is developed and optimized. We firstly explore the acoustofluidic biosensing performance of the flexible devices, and identify the optimum thickness range to both maintain efficient microfluidic actuation and enable significant deformation of the substrate, providing a guide to design such a wearable biosensing devices. We then further apply it as a loudspeaker, a microphone, or an ambient sensor depending on the selection of its excitation frequencies. When used as a speaker, the proposed structure shows a high sound pressure level, a low total harmonic distortion and a uniform directivity. When used as a microphone, the proposed device shows a precision of 98% for speech recognition, and the measured audio signals show a strong similarity to the original audio ones, demonstrating its equivalent performance compared to a rigid commercial microphone.

Keywords: Flexible acoustic platform, piezoelectric film, acoustic wave, human-machine interaction, environmental perception