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Topic of the Speech:

Wireless and Wearable Humidity Sensors with Enhanced Stability and Sensitivity made with Water-based Hexagonal Boron Nitride Inks

Professor Xiuju Song

Zhejiang University
China

Professor Xiuju Song is currently a Professor of School of Mechanical Engineering in Zhejiang University. She received her Doctor degree from Peking University on July, 2016. After that she has two years Postdoc experience in Prof. Manish Chhowalla's group from Rutgers University. Two year later she moved to University of Manchester as a Marie Curie Fellow and joined Prof. Cinzia Casiraghi's group. In May 2023, she joined in the Zhejiang University as a Professor.

Her research mainly focuses on synthesis of 2D materials for wearable sensors to detect various parameters, such as strain, humidity, strain, pH etc for wearable electronics. She has extensive experience on synthesis and characterization of 2D materials from her PhD in China. After joining the group of Prof. Casiraghi, she have decided to focus my research on printed sensors made of 2D material beyond graphene. While graphene has attracted strong attention because of its unique electronic properties, there are several challenges in the exploitation of this material in sensors, such as cross-sensitivity and hysteresis. She investigated the use of solution-processed 2D materials beyond graphene to fabricate stable and reliable sensors for wearable electronics. This material is characterized by excellent thermal and chemical stability and its surface properties can be easily tailored.

She has over 30 peer-reviewed publications on high impact journals including Nature, Nature Materials, Nature Communications, ACS Nano, etc. Her H index is 24 and her works have collected 4000 citations. She is the Youth editor of the international journal of The Innovation and the Frontiers of Nanotechnology. She is also co-inventor in one patent filed in China. She is a frequent referee for Nature Communications, ACS Nano, Applied Surface Science and Nanoscale Advances.

ABSTRACT SUBMISSION
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Wireless and Wearable Humidity Sensors with Enhanced Stability and Sensitivity made with Water-based Hexagonal Boron Nitride Inks

Liming Chen[2], Wuliang Yin[2]*, Cinzia Casiraghi[3]*, Xiuju Song[2,3]*

[1] *School of Mechanical Engineering, Zhejiang University, Yuhangtang Road, Hangzhou, Zhejiang, 310058, China.*
[2]*Department of Chemistry, University of Manchester, Oxford Road, Manchester, M13 9PL, UK*
[3] *School of Electrical and Electronic Engineering, University of Manchester, Manchester, M13 9PL, UK*
Presenter's email: songxiuju@zju.edu.cn

ABSTRACT (NO MORE THAN 500 WORDS:)

Two-dimensional (2D) materials show great promise in sensing applications due to their unique chemical and physical properties, high surface area-to-volume ratios and ultra-high surface sensitivity to the environment. In particular, solution processed 2D materials offer a simple and low-cost way to fabricate a wide range of sensors. Hexagonal boron nitride (h-BN), a new generation of two-dimensional (2D) material has been recognized by its excellent stability under high temperature, high pressure and corrosive environment. However, the application of h-BN is still very limited.

Here, we prepared hydrophilic h-BN via ultrasonic exfoliation technology and opened a new door to the application of h-BN in humidity sensing. Reversible dynamic process of hydrogen bond (H-O-S) formation and cleavage endows a decrease of resistance over six orders of magnitude and an increase of capacitance from 5% to 100% in the relative humidity (RH) range. Based on the effective sensor, a wearable respiration monitoring system with a user-friendly and portable wireless transmission module were constructed to record signals of different individuals and daily activities (e.g. watching video, reading, running, deep breathing and swallowing) in real time. More importantly, the breathing sensor is successfully used to monitor several common symptoms of COVID-19 and flu, including cough, fever, runny and stuffy nose caused shortness of breath or difficulty breathing. The successful sensing system will accelerate the development of the next generation 2D material like h-BN in the field of long-term, real-time and non-contact wireless human health monitoring.