Structure-property relationships in graphene-based strain and pressure sensors for potential artificial intelligence applications

Luo Z. «Foreign» [1],
Hu X. «Foreign» [2],
Tian X. «Foreign» [3],
Luo C. «Foreign» [4],
Xu H. «Foreign» [5],
Li Q. «Foreign» [6],
Zhang J. «Foreign» [7],
Qiao F. «Foreign» [8],
Wu X. «Foreign» [9],
Borisenko V. E. [10],
Chu J. «Foreign» [11]

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1, 2, 3, 4, 5, 6, 7, 8, 9, 11 Shanghai Key Laboratory of Multidimensional Information Processing, Department of Electronic Engineering, East China Normal University, Shanghai 200241, China.
9 Shanghai Institute of Intelligent Electronics & Systems, Fudan University, Shanghai 200433, China
9, 11 Department of Electronic Engineering, Tsinghua University, 30 Shuangqing Road, Beijing 100084, China
10 Belarusian State University of Informatics and Radioelectronics, P. Browka 6, 220013 Minsk, Belarus; National Research Nuclear University MEPhI (Moscow Engineering Physics Institute), Kashirskoe Shosse 31, 115409 Moscow, Russia
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Abstract. Wearable electronic sensing devices are deemed to be a crucial technology of smart personal electronics. Strain and pressure sensors, one of the most popular research directions in recent years, are the key components of smart and flexible electronics. Graphene, as an advanced nanomaterial, exerts pre-eminent characteristics including high electrical conductivity, excellent mechanical properties, and flexibility. The above advantages of graphene provide great potential for applications in mechatronics, robotics, automation, human-machine interaction, etc.: graphene with diverse structures and leverages, strain and pressure sensors with new functionalities. Herein, the recent progress in graphene-based strain and pressure sensors is presented. The sensing materials are classified into four structures including 0D fullerene, 1D fiber, 2D film, and 3D porous structures. Different

structures of graphene-based strain and pressure sensors provide various properties and multifunctions in crucial parameters such as sensitivity, linearity, and hysteresis. The recent and potential applications for graphene-based sensors are also discussed, especially in the field of human motion detection. Finally, the perspectives of graphene-based strain and pressure sensors used in human motion detection combined with artificial intelligence are surveyed. Challenges such as the biocompatibility, integration, and additivity of the sensors are discussed as well.

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