

On-chip assembly of 3D graphene-based aerogels for chemiresistive gas sensing

Gaofeng Shao^{a,*}, Oleksandr Ovsianytskyi^b, Maged F. Bekheet^b, Aleksander Gurlo^b

a. Institute of Advanced Materials and Flexible Electronics (IAMFE), School of Chemistry and Materials Science, Nanjing University of Information Science & Technology, 210044, Nanjing, China

b. Fachgebiet Keramische Werkstoffe / Chair of Advanced Ceramic Materials, Technische Universität Berlin, Hardenbergstr. 40, 10623, Berlin, Germany

Email: gfshao@nuist.edu.cn

Integration of the materials preparation step into the device fabrication process is of prime importance for the development of high performative devices. This study presents an innovative strategy for in situ assembly of graphene-based aerogels on chip by polymerization-reduction and annealing process. As a proof of concept, the as-fabricated 3D polypyrrole coupled graphene /W₁₈O₄₉ nanowire aerogels are applied as chemoresistive gas sensors for detection of low concentrations of NO₂, and exhibit outstanding sensitivity and stability. The enhanced sensitivity ($\Delta R/R_0=29.78\%$) towards 0.975 ppm of NO₂, stems from the unique conductive, interconnected porous structure and double p-n heterojunctions. This work opens up a new avenue to in-situ fabricate 3D graphene based aerogels for high-performance devices such as chemiresistors.