UV Light Enhanced Room Temperature NO_2 Gas Sensing Performances Based on Sulfur-doped Graphitic Carbon Nitride Nanoflakes

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The 2D nanomaterials area has been expanded immeasurable since the invention of graphene. Most of the researchers have explore several compulsive physical phenomena when the dimension of materials mutates from 3D to 2D. The electrifying properties of 2D nanomaterials include good flexibility, excellent mechanical strength, quantum confinement, and high transparency, that make them acceptable for wide industrial applications. Mono-layer and few-layered nanomaterials exhibit Some rousing physics because of the quantum confinement effect than typical bulk materials. Very interestingly, a small alteration in the atomic layers of 2D nanomaterials will result in a change in its physiochemical properties that further enriches the optical absorption capabilities. Therefore, it is crucial to control the extension parameters of 2D nanomaterials for their specific applications. Nonetheless, their sustainability and low mass production control their applications, however these bottle necks can be avoided by utilizing some modified synthesis techniques. The improvement in the synthesis and device fabrication of 2D g-C_3N_4 has been extensively prospect due to its excellent optoelectronics and nanoelectronics application over the last two decades. Furthermore, the abnormal properties of g-C_3N_4 make it an appropriate candidate as a gas sensor for the effective detection of toxic, hazardous and flammable gases. Graphitic carbon nitride (GCN) comprise of crystalline bonds of nitrogen and carbon atoms with seven phases. Amidst all phases, graphitic carbonitride (g-C_3N_4) is the popular stable phase of CN under atmospheric ambiences, due to their excellent chemical and thermal stability, that further enables the acceptance of doping agents into the crystal lattice without any degradation of structural moieties. Moreover, the functional groups such as, lone pair of electrons, amine, hydroxyl, C-N and N-H bond presents in the GCN network would substantially enhances the gas absorption capability and improve the gas sensing characteristics.

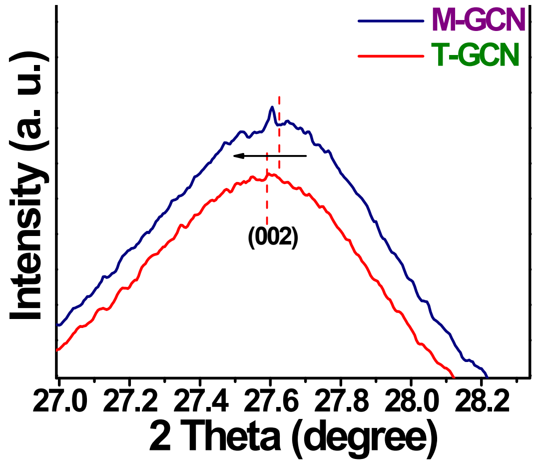

Fig. S1 The enlarged XRD pattern of M-GCN (blue) and T-GCN (red).

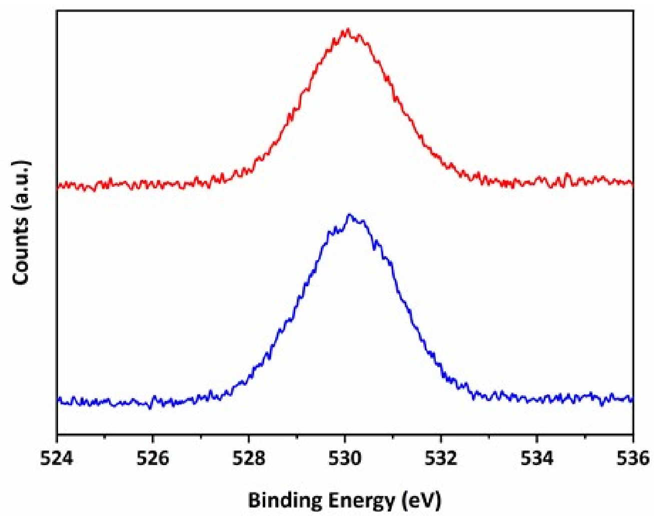

Fig. S2 The core level of O 1s in M-GCN (blue) and T-GCN (red).

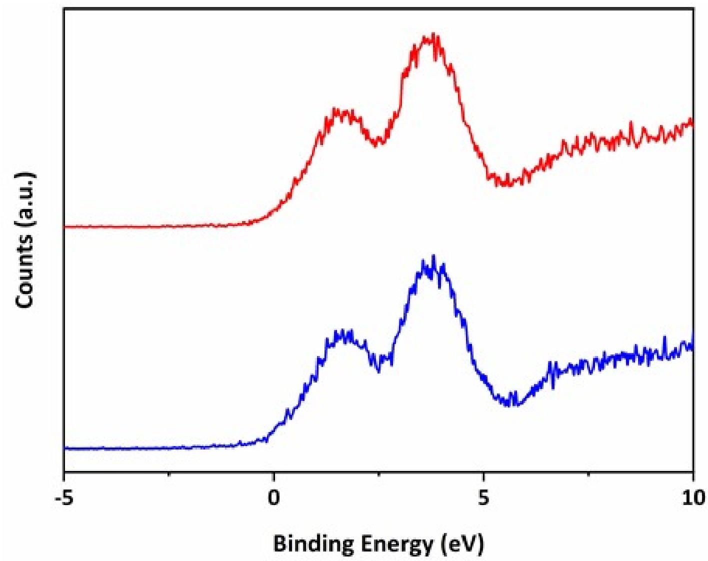

Fig. S3 XPS valence band offset of M-GCN (blue) and T-GCN (red).

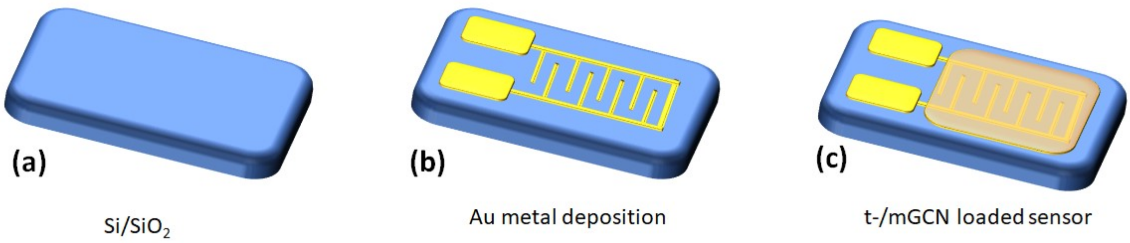

Fig. S4 Schematic illustration of the fabrication of GCN based sensor for NO_2 gas sensing application.

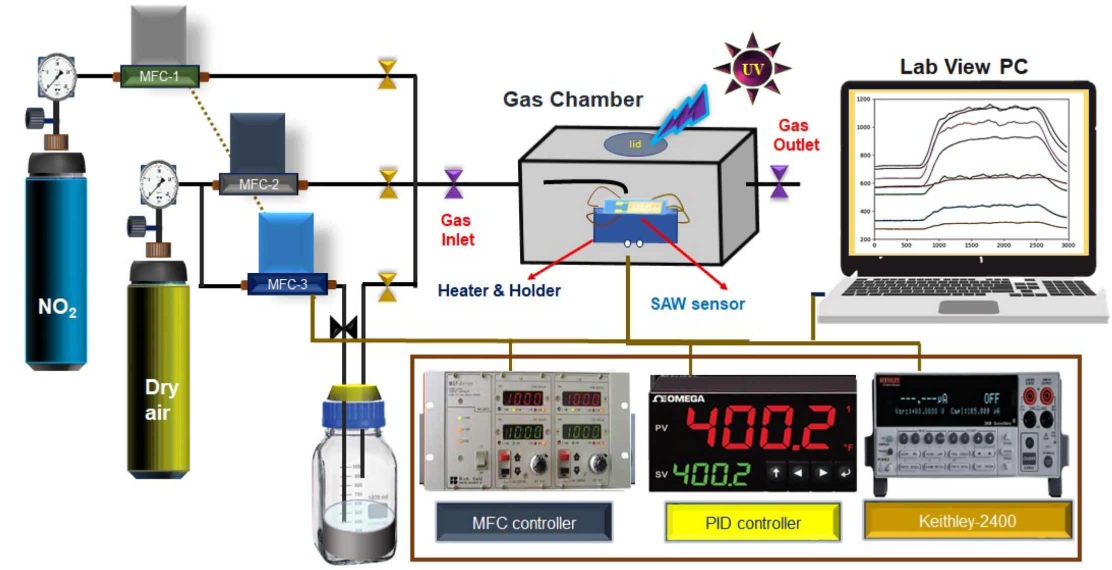

Fig. S5 Schematic illustration of the fabrication of M-GCN/T-GCN resistive based sensor for NO_2 gas sensing application, (d) experimental gas sensing system setup.