Optimization of graphene-based gas sensors: UV irradiation and defect engineering

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Gas sensors are essential for monitoring gaseous atmospheric pollutants, including NO2, particularly at low concentrations below recommended exposure limits. Various technologies and materials are under exploration for this purpose; however, chemiresistive graphene-based gas sensors stand out due to their stability, room temperature operation, and efficiency. Despite their promising attributes, these sensors encounter two primary challenges hindering their industrial implementation: (1) low desorption ratio post-analyte exposure, known as partial recovery, and (2) limited selectivity, leading to potential interference among different analytes.

To address these challenges, continuous UV irradiation during device operation [1,2] and defect engineering [3,4] of the sensitive material emerge as promising strategies (See Figure 1 a and b, respectively). These methods aim to optimize graphene-based gas sensors by enhancing response, recovery, and selectivity. Current investigations are focusing on diverse non-oxidized graphene-based materials to elucidate underlying mechanisms and establish guidelines for their effective implementation in real-world environmental monitoring systems.

References

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Figures

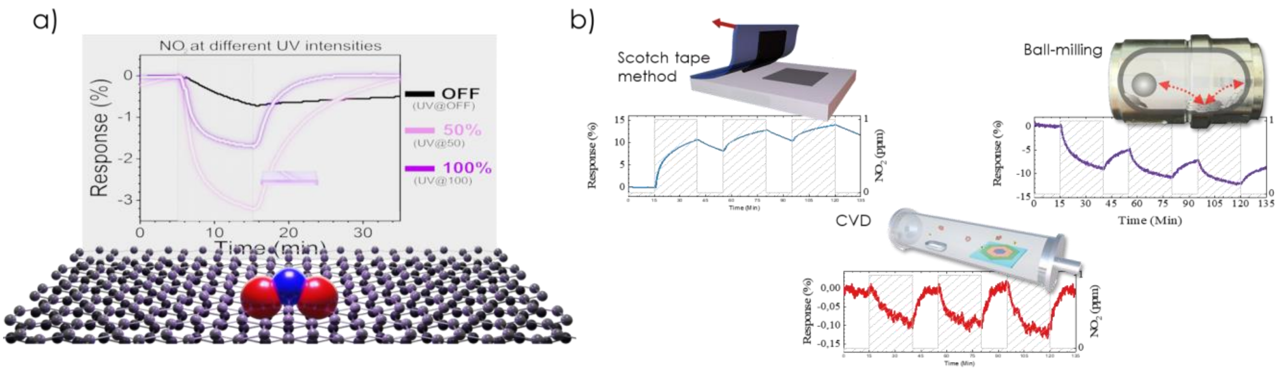

Figure 1: a) Graphene-based gas sensor operating under different UV irradiation conditions and (b) sensing behaviour of different graphene-based materials.