Enhanced NO_2 sensing at room temperature with graphene via monodisperse polystyrene bead decoration

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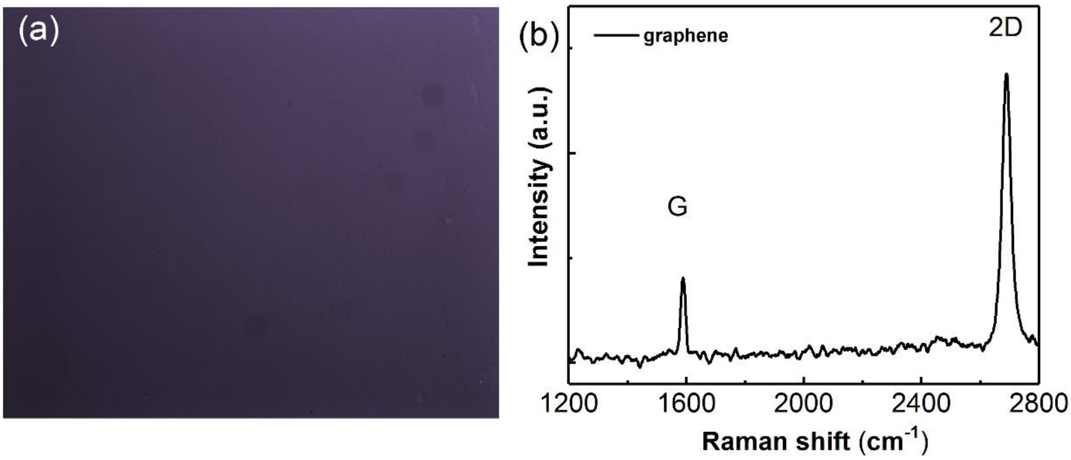

Figure S1. (a) Optical image and (b) corresponding Raman spectra of graphene on Si substrate with a 300 nm SiO_2.

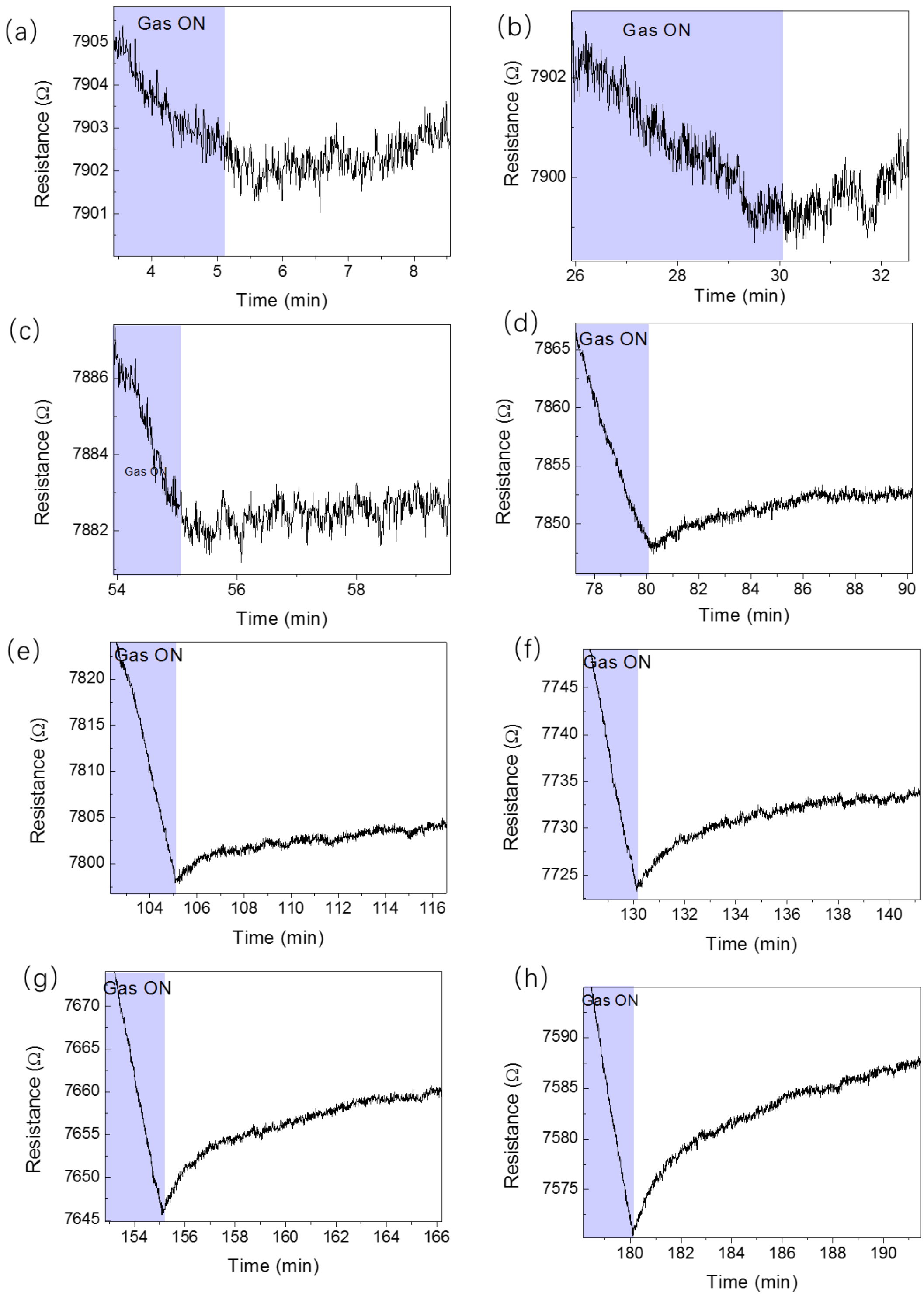

Figure S2. Magnified gas sensing dynamics under each gas concentration in Fig. 3b.

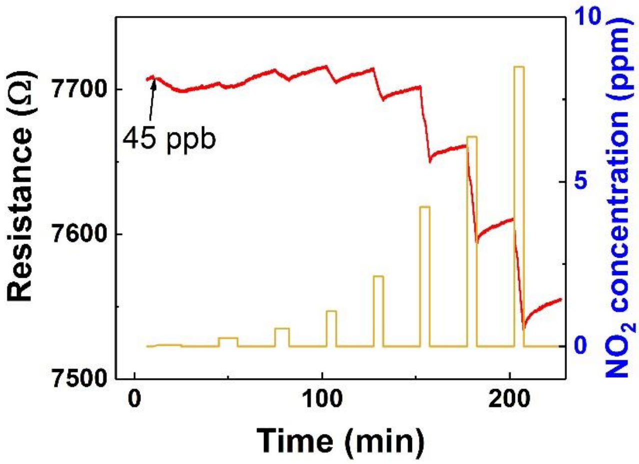

Figure S3. Dynamic-sensing response of the graphene sensor after PS bead drop coating measured under 635 nm photo-illumination.

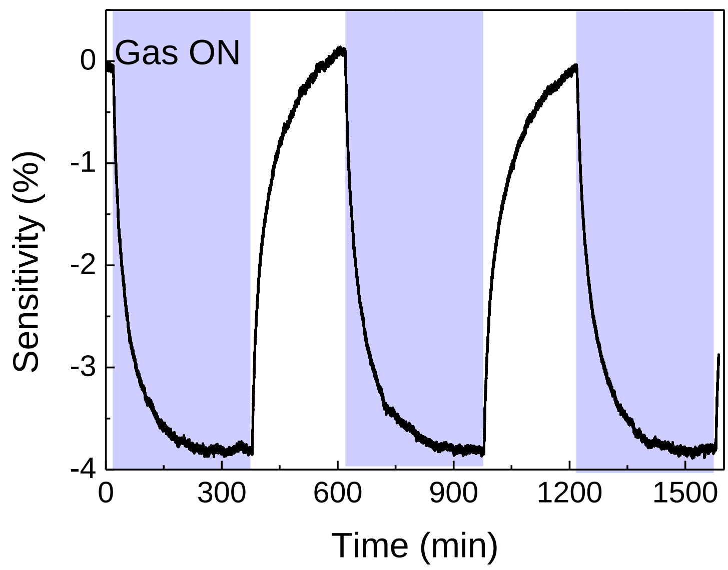

Figure S4. Multi-cycle responses of sensor when exposed to 8800 ppb NO_2.

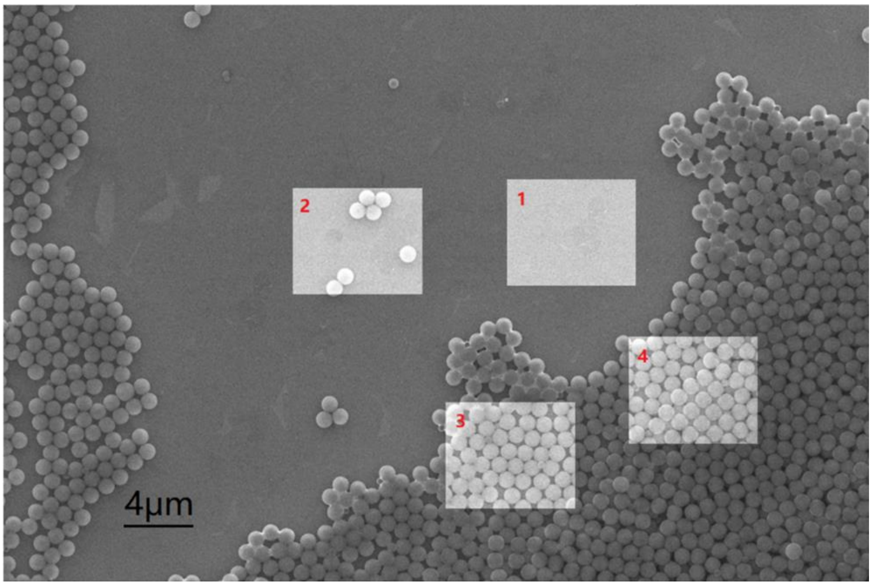

Figure S5. Low magnification SEM images for Figure 4b and the areas 1-4 with different PS bead distribution are clearly marked.

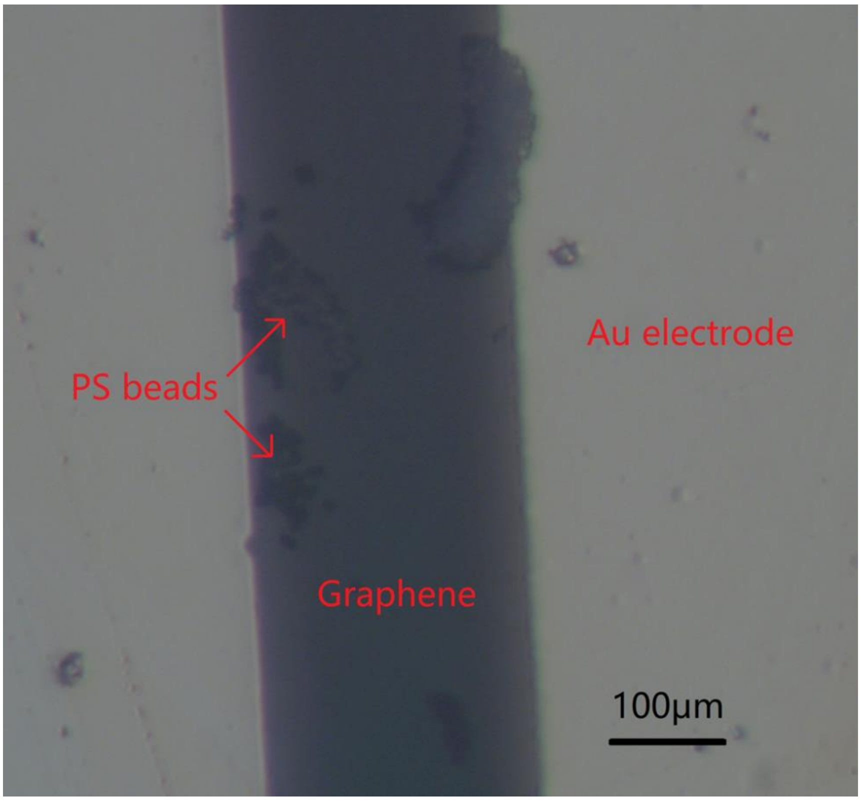

Figure S6. Typical photographic image of a device.

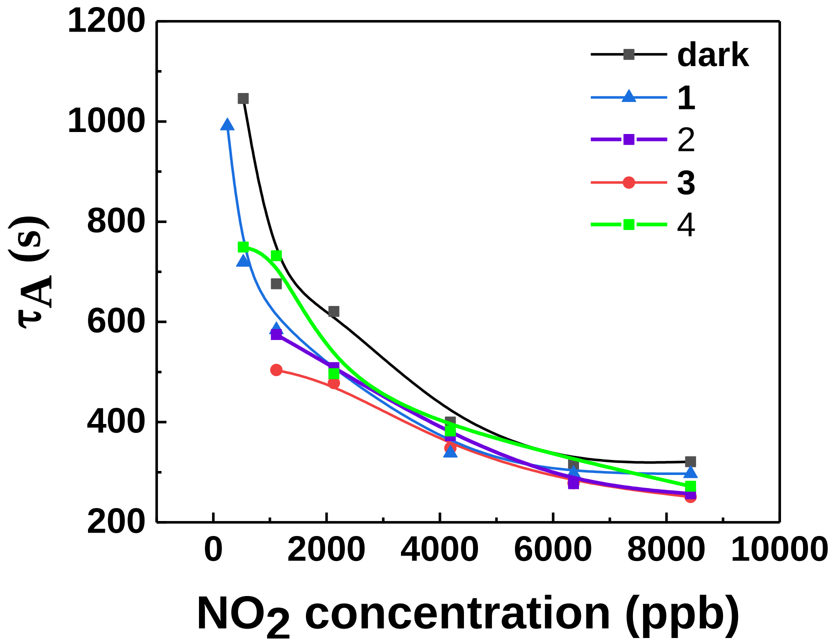

Figure S7. Adsorption time as a function of gas concentration for a variety PS coverage concentration illumination conditions.

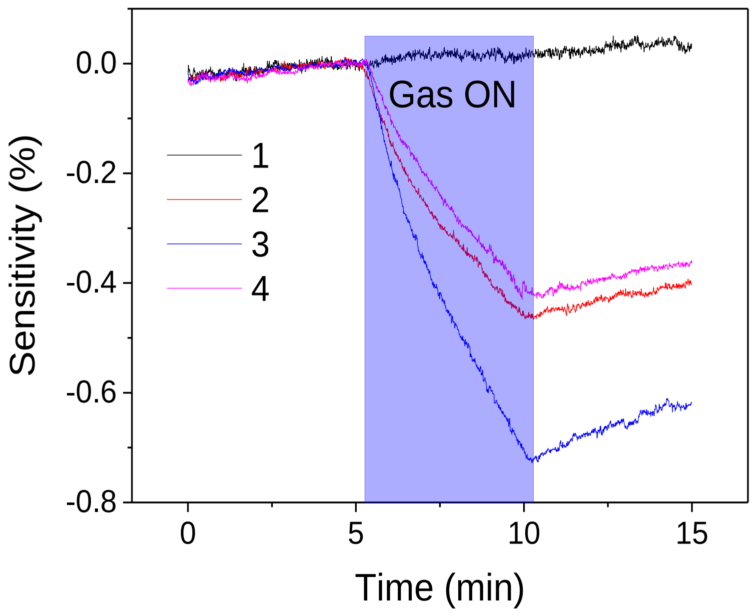

Figure S8. Dynamic-sensing response of four graphene sensors with different PS concentrations measured in darkness against 250 ppb NO_2, where, 1, 2, 3, and 4 denote devices without PS (1), with few PS beads (2), with a monolayer PS beads (3), and with multilayers PS beads (4), respectively.

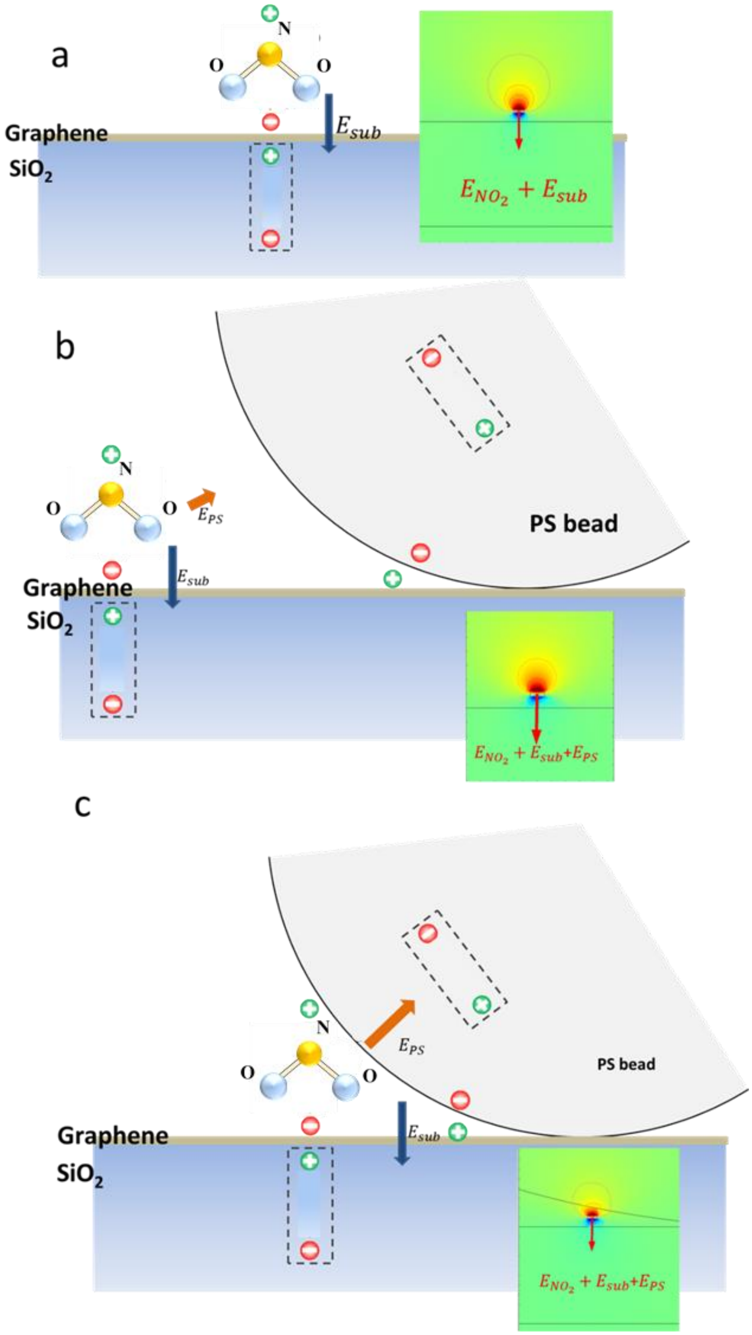

Figure S9. (a) Simulated the electric field of NO_2 molecular on top of graphene, the total electric field of NO_2 molecular equal to the dipole field of NO_2 molecular E_{NO_2} plus the image field of the Graphene/SiO_2 substance E_{sub} . (b) Simulated electric field potentials of NO_2 molecular near the Graphene/PS beads interface, the enhanced electric field of NO_2 molecular due to the image field of PS sphere E_{PS} . (c) Simulated electric field potentials of NO_2 molecular absorbed into the concave of Graphene and PS beads, the effect of E_{PS} is more obvious than (b).