Supporting Information

Crumpled Graphene Oxide for Enhanced Room Temperature Gas Sensing: Understanding the Critical Roles of Surface Morphology and Functionalization

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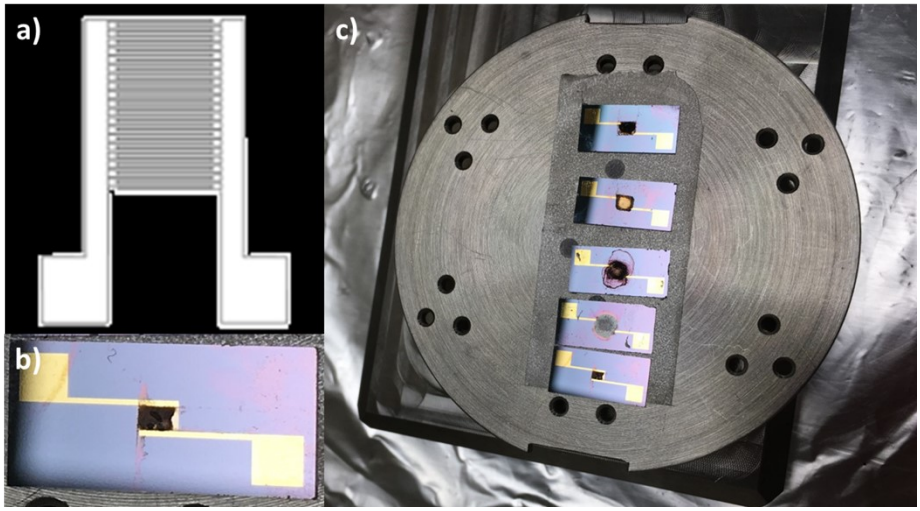

Figure S1. A photo of gas sensing device; a) sample of interdigitated electrode design used for fabrication of gas sensing devices, b) sample sensing device for design, and c) sample sensing devices during optimization process.

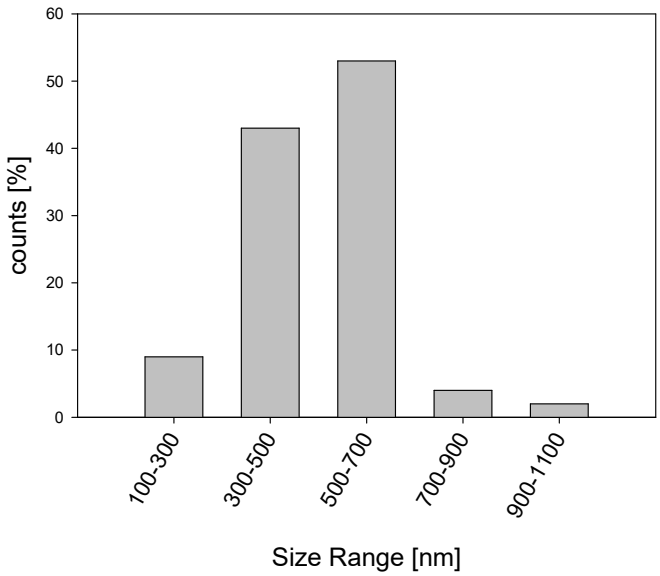

Figure S2. Size distribution of the crumpled graphene oxide measured from TEM images (dashed lines are guide lines for visualization only).

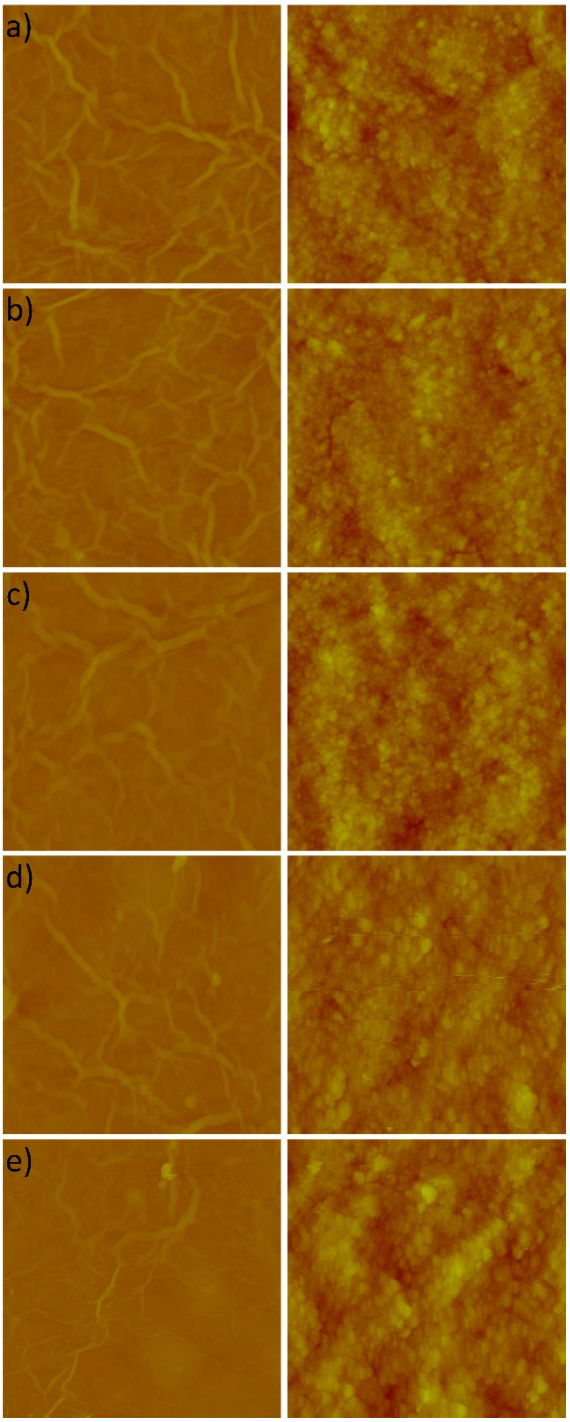

Figure S3. AFM scans of 30 μm × 30 μm portions of GO (left) and CGO (right) films annealed at (a) 60 °C for 1 hour and 220 °C for (b) 4 minutes, (c) 1 hour, (d) 4 hours, and (e) 24 hours.

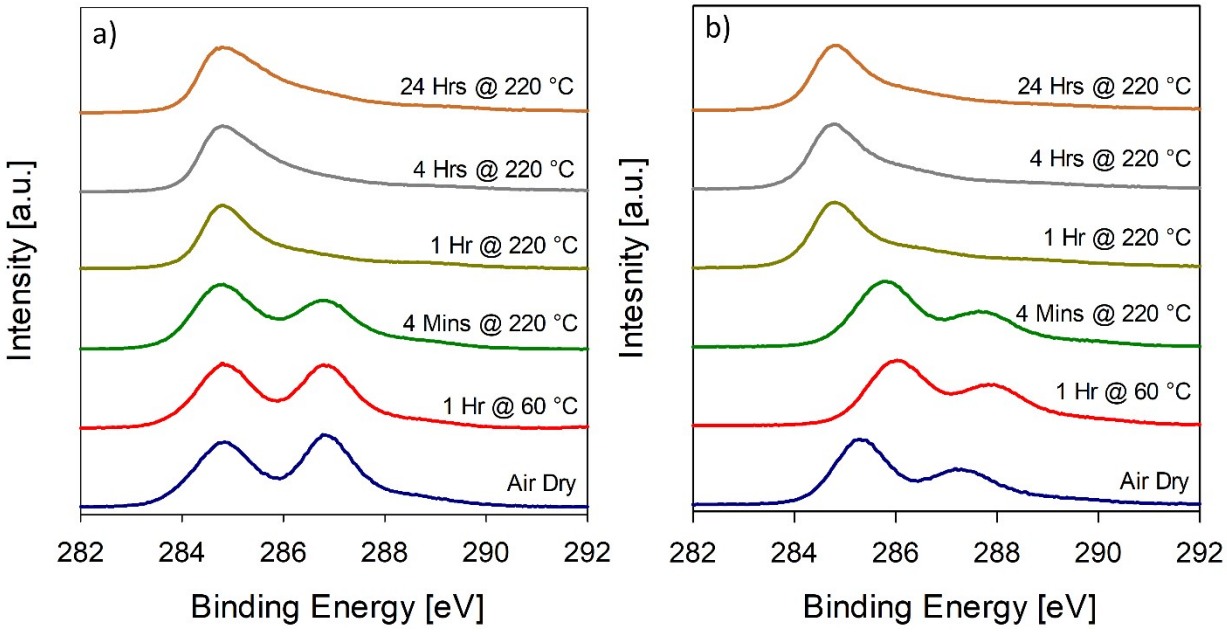

Figure S4. Evolution of the XPS C 1S spectra regions of (a) GO and (b) CGO annealed at 60 °C for 1 hour, and further processed at 220 °C for 4 minutes, 1 hour, 4 hours, and 24 hours.

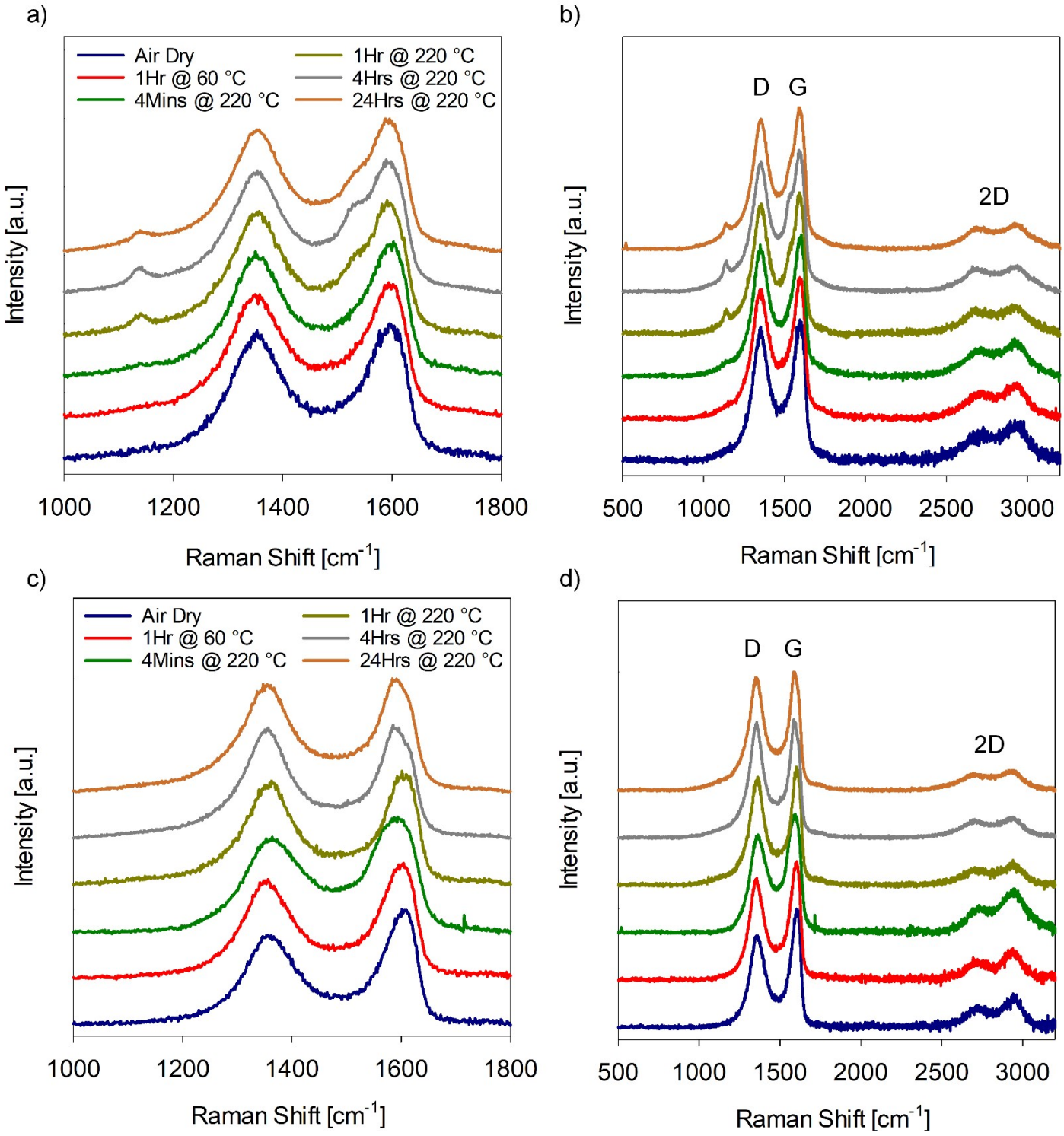

Figure S5. Raman spectra of the G-and D-peak evolution of (a) CGO and (c) GO and the full spectrum showing the 2D peaks of (b) CGO and (d) GO.

Influence of Humidity

Additional experiments were carried out under high humidity conditions to determine the impact on the sensing performance. Gas sensing measurements were performed on the same system previously described in the paper. The sensors were preconditioned by flowing humidified, filtered air at 750 sccm for one hour prior to the pulsed testing. Each pulsed test consisted of five cycles alternating between five minutes of filtered air with ethanol at different concentrations (gas) followed by five minutes of filtered room air (degas). Throughout the cycling process, the air flow was maintained at 750 sccm. Five different concentrations were tested: 20, 40, 50, 100, and 200 ppm. The relative humidity of the flowed-gas was adjusted by flowing the dilution air through a glass bubbler with water to produce a water-saturated air. The wet dilution stream was mixed with the dry vapor gas stream to create high RH conditions (96%) in the gas flow chamber. Under these high relative humidity conditions, the crumpled graphene oxide sensors should poor response to ethanol, indicating that a dehumidification step may be necessary for optimized sensitivity.