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Electronic Supplementary Material (ESI)

Monitoring a CuO gas sensor at work: an advanced *in situ* X-ray absorption spectroscopy study†

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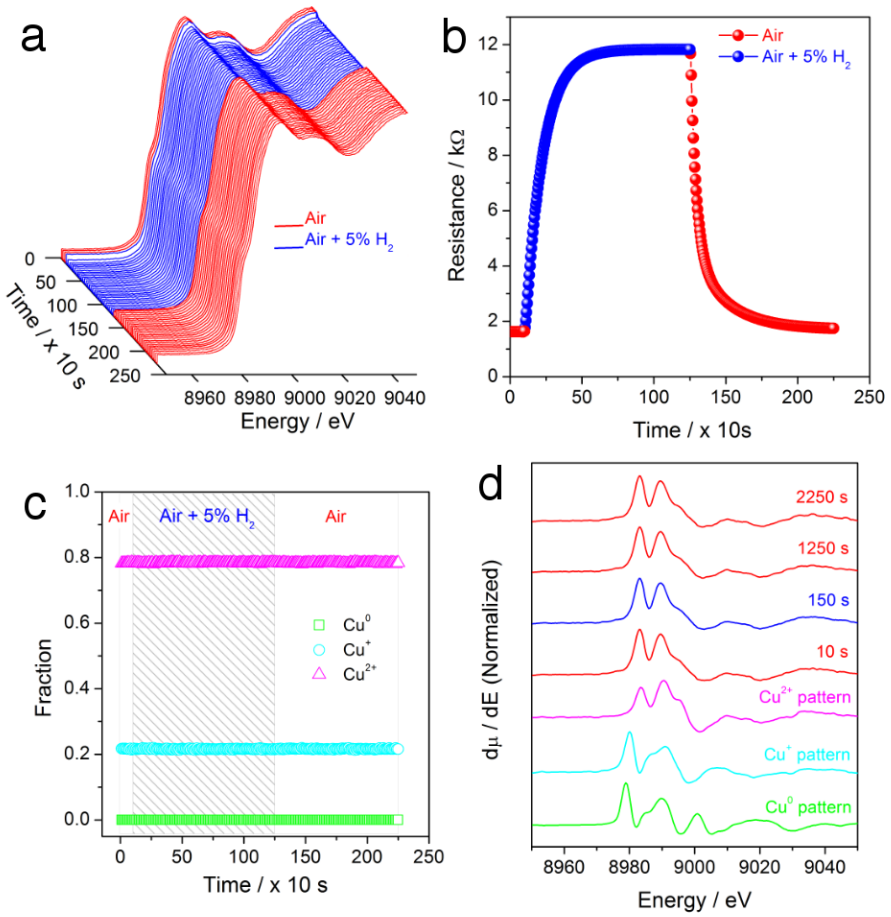

Figure S1. *In situ* measurements of urchin-like CuO nanostructures at 200°C under cyclic exposure to synthetic dry air as the baseline and to synthetic dry air (95%) plus H_2 (5%) as the target gas. a) Time-resolved XANES spectra at the Cu K-edge; b) electrical resistance over time; c) copper fraction species over time and d) first derivative of the Cu K-edge XANES spectra at different times.

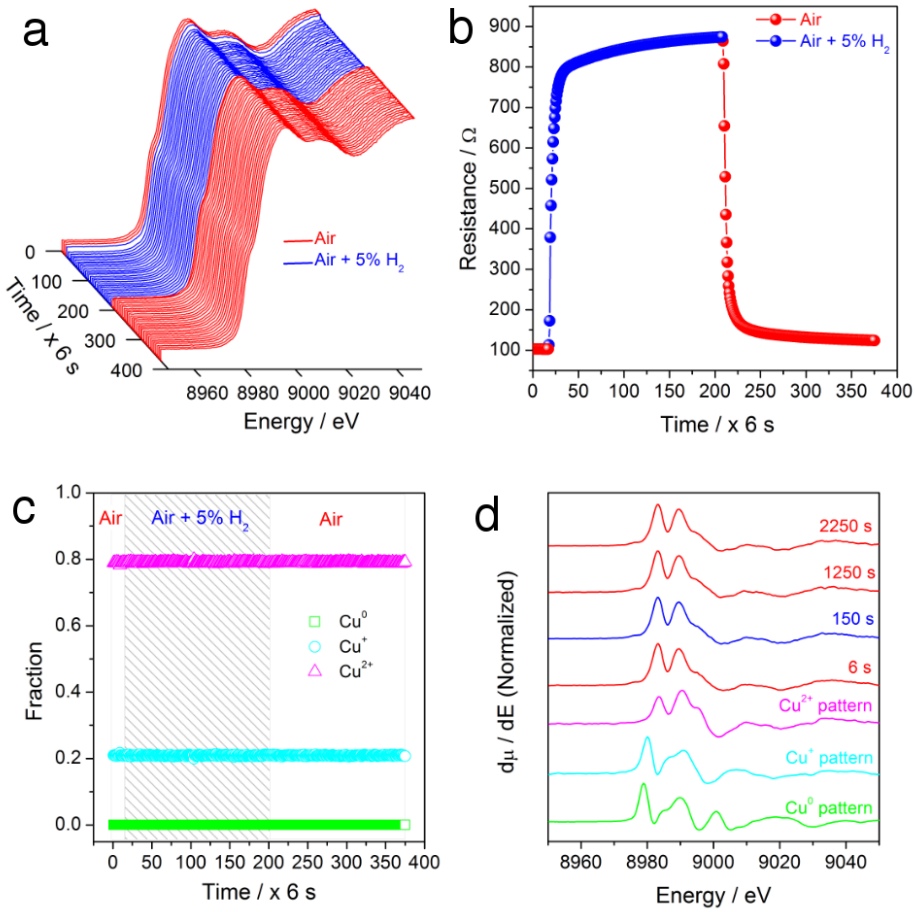

Figure S2. *In situ* measurements of urchin-like CuO nanostructures at 300°C under cyclic exposure to synthetic dry air as the baseline and to synthetic dry air (95%) plus H_2 (5%) as the target gas. a) Time-resolved XANES spectra at the Cu K-edge; b) electrical resistance over time; c) copper fraction species over time and d) first derivative of the Cu K-edge XANES spectra at different times.

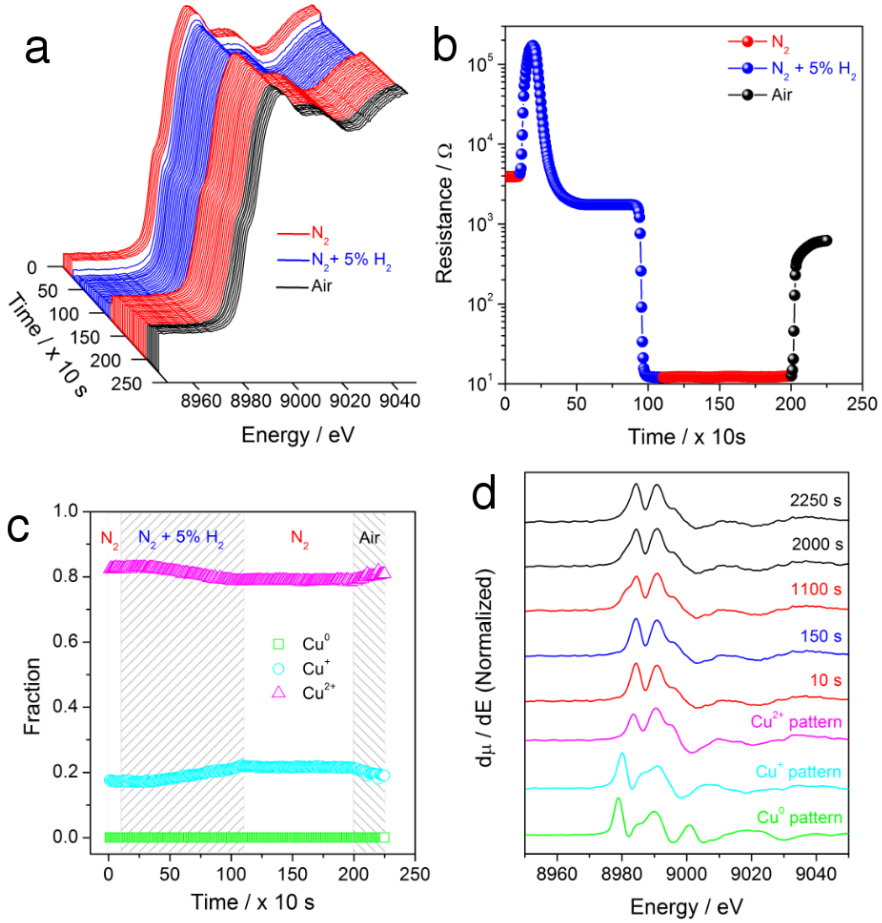

Figure S3. *In situ* measurements of urchin-like CuO nanostructures at 200°C under cyclic exposure to pure dry nitrogen as the baseline and to pure dry nitrogen (95%) plus H_2 (5%) as the target gas. a) Time-resolved XANES spectra at the Cu K-edge; b) electrical resistance over time; c) copper fraction species over time and d) first derivative of Cu the K-edge XANES spectra at different times.

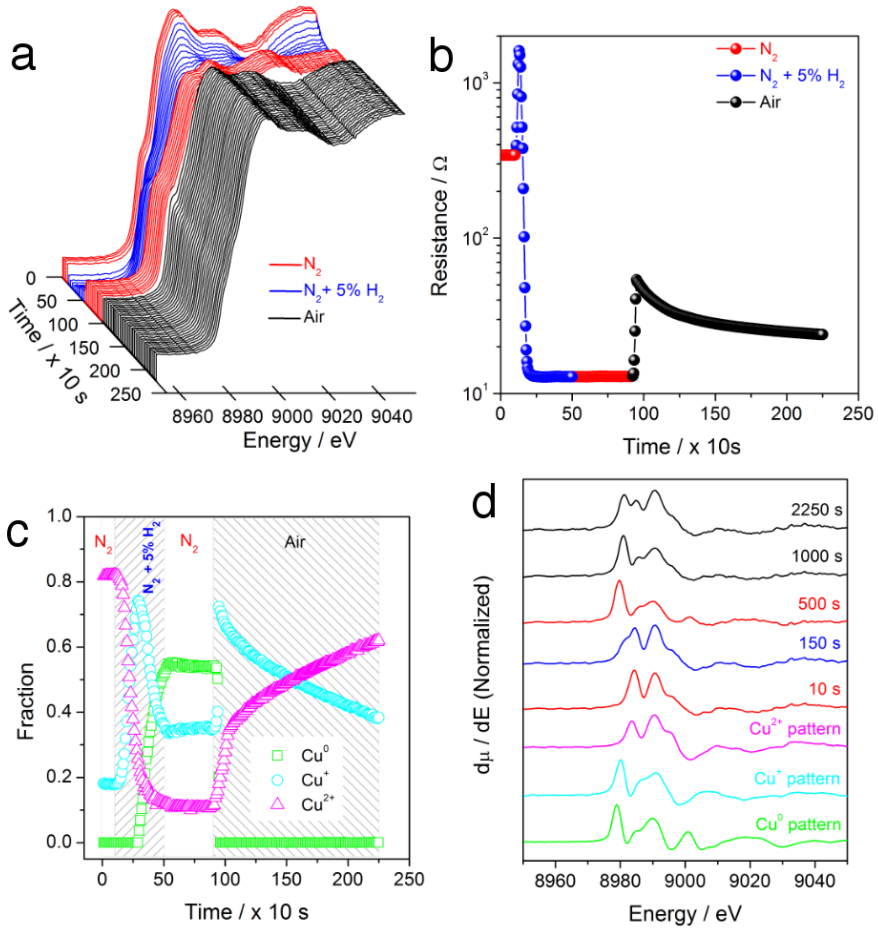

Figure S4. *In situ* measurements of urchin-like CuO nanostructures at 300°C under cyclic exposure to pure dry nitrogen as the baseline and to pure dry nitrogen (95%) plus H_2 (5%) as the target gas. a) Time-resolved XANES spectra at the Cu K-edge; b) electrical resistance over time; c) copper fraction species over time and d) first derivative of Cu the K-edge XANES spectra at different times.

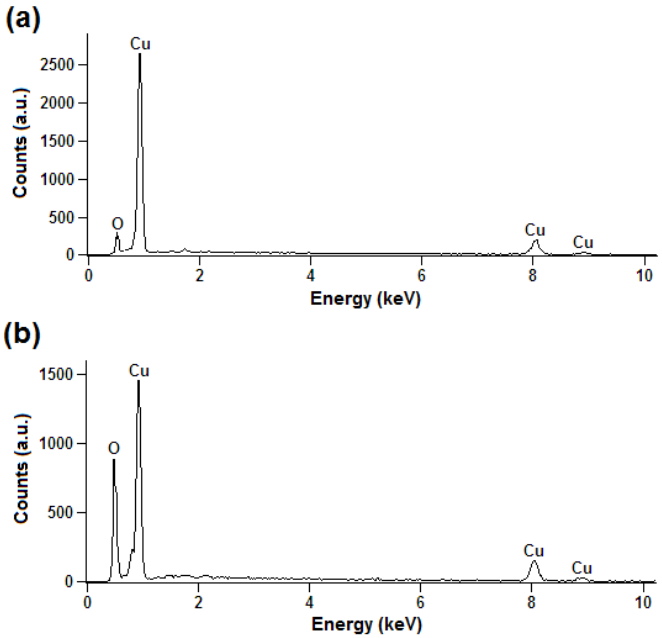

Figure S5. EDX spectra of urchin-like CuO nanostructures (a) after reducing process with hydrogen gas and (b) after oxidation process with oxygen gas at 400°C