Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.

Supporting information for

Synthesis of Single Crystalline In_2O_3 octahedra for the selective detection of NO_2 and H_2 at trace levels

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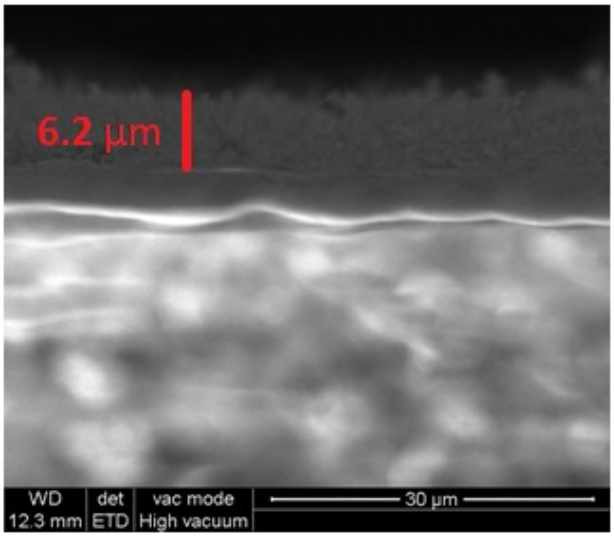

Fig S1: Cross-sectional image of the sensor showing the active material layer on top of the alumina substrate.

EDS analysis was performed over the pure In_2O_3 octahedra

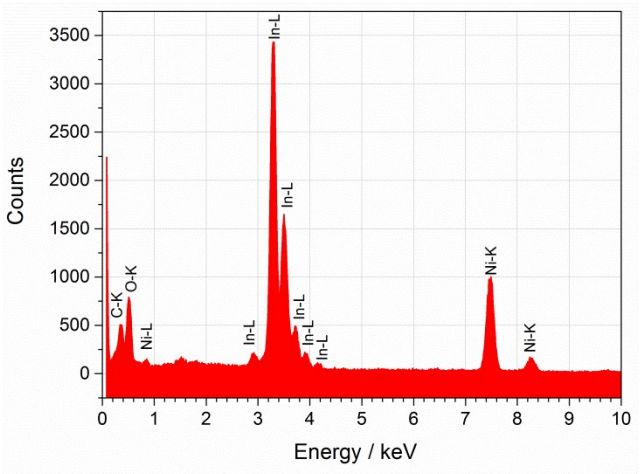

Fig. S2. EDS patterns of the pure In_2O_3 octahedra.

As shown in Fig. S1, pure In_2O_3 structures were obtained from the CVD process. The Ni and C peaks observed originate from the grid used to perform the EDS.

Further XRD analysis was performed on the Pt and Pd-doped In_2O_3 octahedra samples.

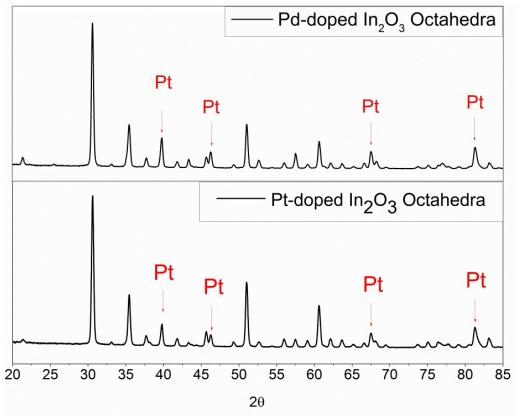

Fig. S3. XRD patterns of the Pt and Pd-doped In_2O_3 octahedra.

As shown in Fig. S1, both samples present the typical pattern of cubic In_2O_3. Additionally, peaks arising from Pt can be found in both samples. However, these peaks do not come from the Pt nanoparticles. Their origin lies in the Pt electrodes of the substrates.

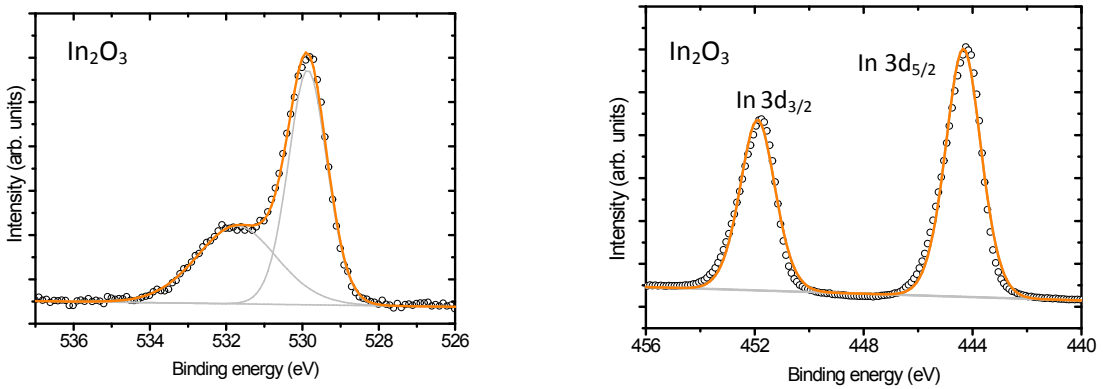

Fig. S4: XP spectra of the pristine In_2O_3

The In 3d core level spectra of pristine In_2O_3 octahedra are shown in Fig. S4. These are composed of two components, relative to the spin-orbit doublets ($3d_{5/2}$ and $3d_{3/2}$) respectively at 444 eV and 451 eV. If we compare these two peaks with the ones of the Pt and Pd decorated samples, we see no difference in the oxidation state of the In_2O_3.

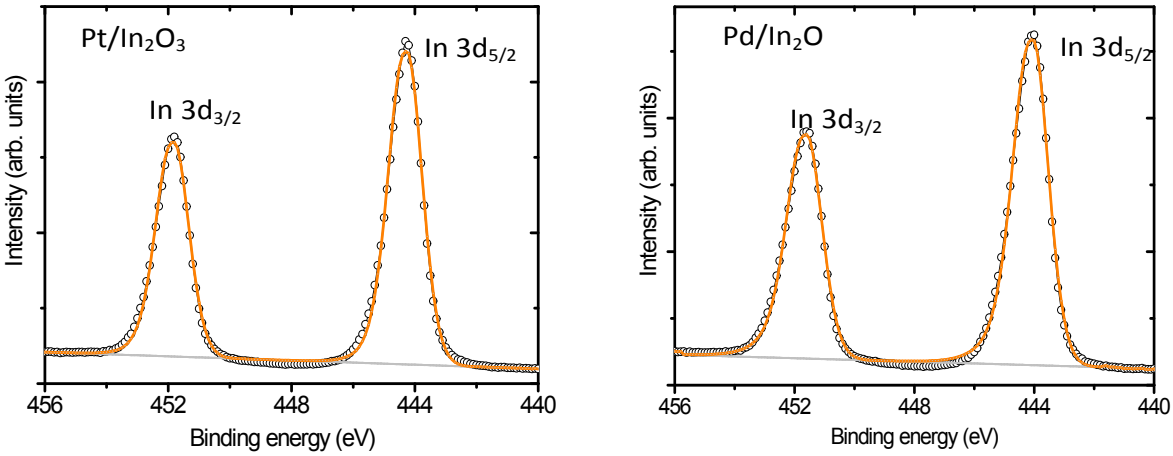

Fig. S5: In 3d core level XP spectra of Pt/In_2O_3 and Pd/In_2O_3.

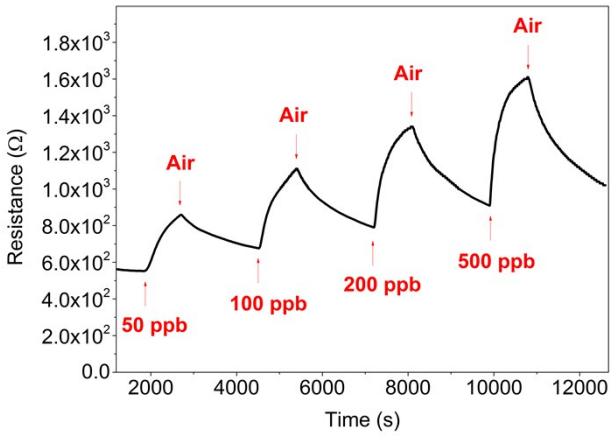

Fig. S6: Response of the In_2O_3 octahedra sensor at room temperature

As we can see in Fig. S5, the sensor responds to low concentrations of NO_2 at room temperature. It is worth to say that the sensor almost recovered the baseline. However, the response is a bit lower than that of the optimum working conditions (130ºC).

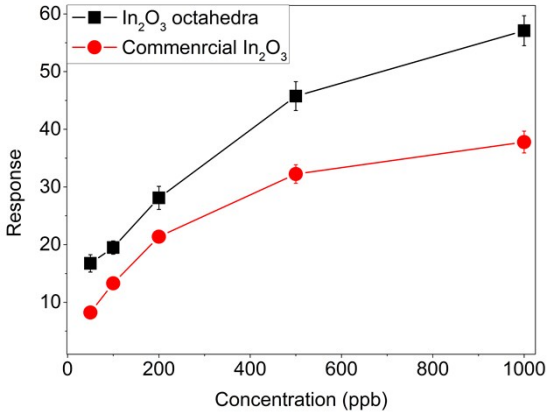

Fig. S7: Comparison between In_2O_3 octahedra sensor and commercial In_2O_3 sensor

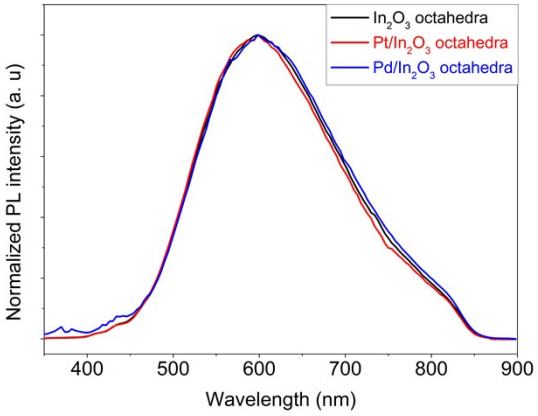

Fig. S8: PL spectra of the sensors exposed to 100 ppm of NO_2

When adding noble metal nanoparticles to the In_2O_3 octahedra, the response towards NO_2 gas is greatly decreased. The responses are summarized in Table S1.

Concentration of NO_2	Pure In_2O_3 octahedra	Pt-doped In_2O_3 octahedra	Pd-doped In_2O_3 octahedra
200 ppb	30	3.1	1.2

Table S1: Comparison between the responses of pure, Pt and Pd-doped In_2O_3 octahedra towards 200 ppb of NO_2 at 130ºC. The response was calculated as $S = R_g/R_a$