

Electronic Supporting Information

On the photocatalytic hydrogen production of $\text{Co}(\text{OH})_2$ nanoparticles coated $\alpha\text{-Fe}_2\text{O}_3$ nanorings

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Supplementary Figures

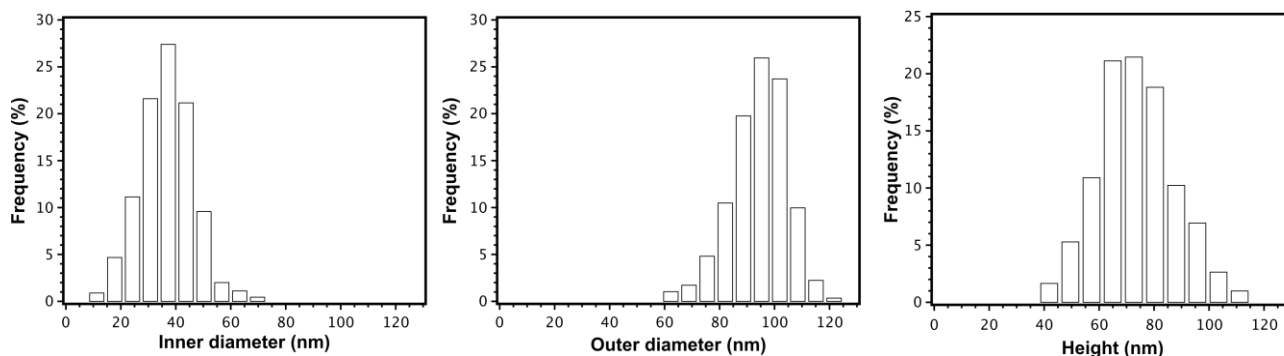


Figure S1. Size distribution obtained by FESEM of the iron oxide nanorings (IONRs) prepared by hydrothermal reaction for 48 h.

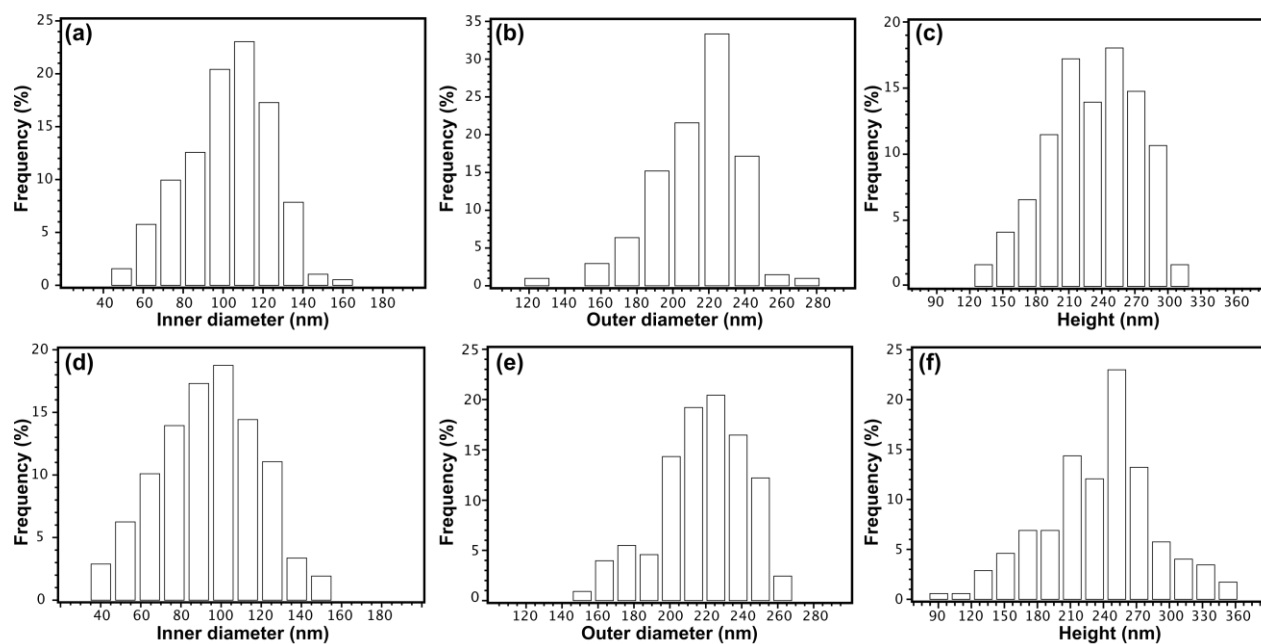


Figure S2. Size distribution obtained by FESEM of the iron oxide nanorings after chemical deposition of cobalt hydroxide nanoparticles on its surface: before (a-c) and after (d-f) annealing at 300 °C for 4h. These results indicate that the annealing process does not affect the mean size of the nanorings.

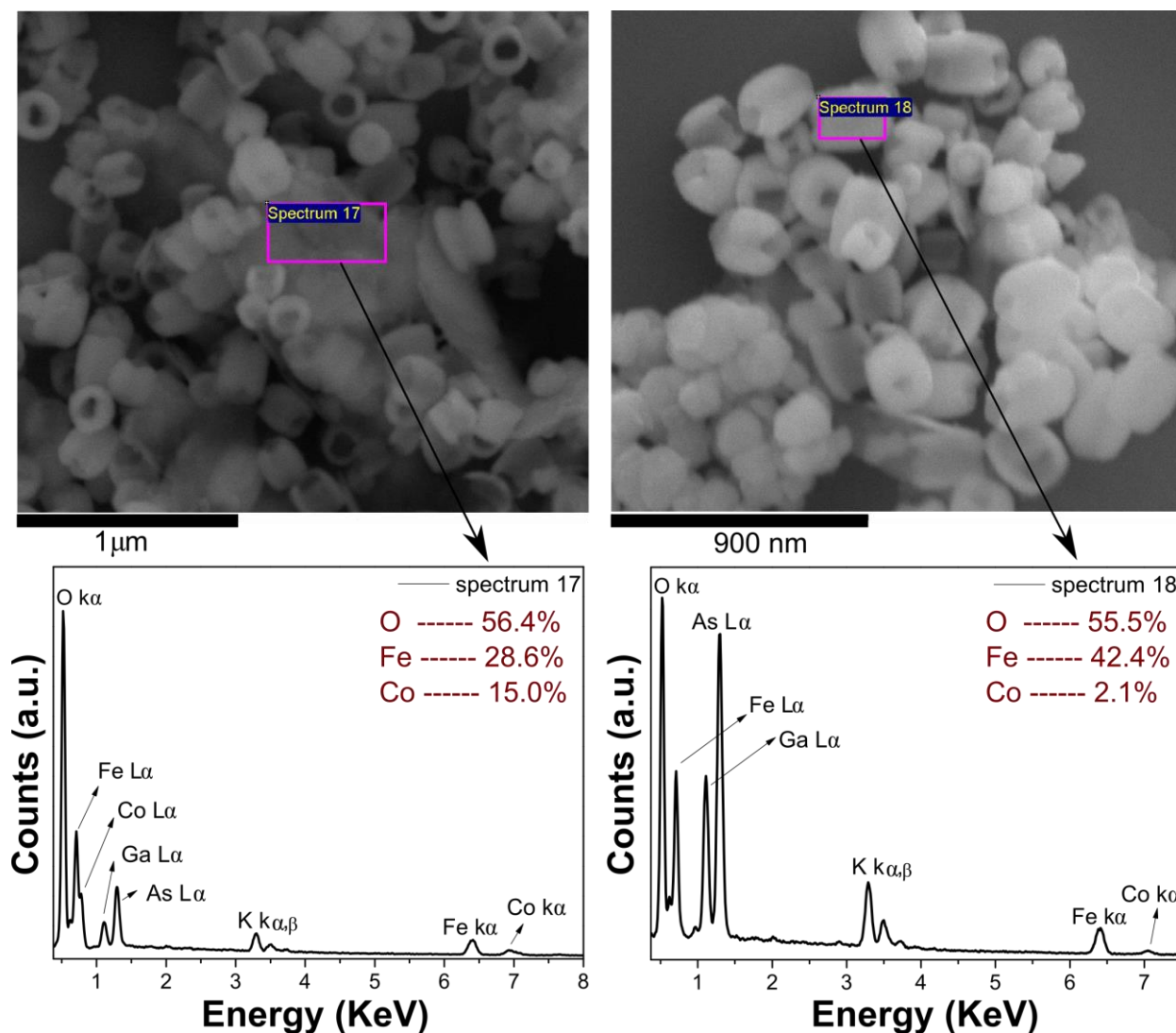


Figure S3. SEM images of the IONRs/Co(OH)₂ NPs and the respective selected-area EDS spectrum. One EDS was performed in the agglomerated region (left) and another in the wall of a selected nanoring (right). The EDS performed in the agglomerated region showed 15.0% of Co atoms, meanwhile the EDS taken at a nanoring wall showed 2.1%. These results show that the agglomerated regions are composed of Co(OH)₂ NPs since it is rich in Co. The lines corresponding to Ga, As and K are coming from the doped GaAs substrate used for the measurements.

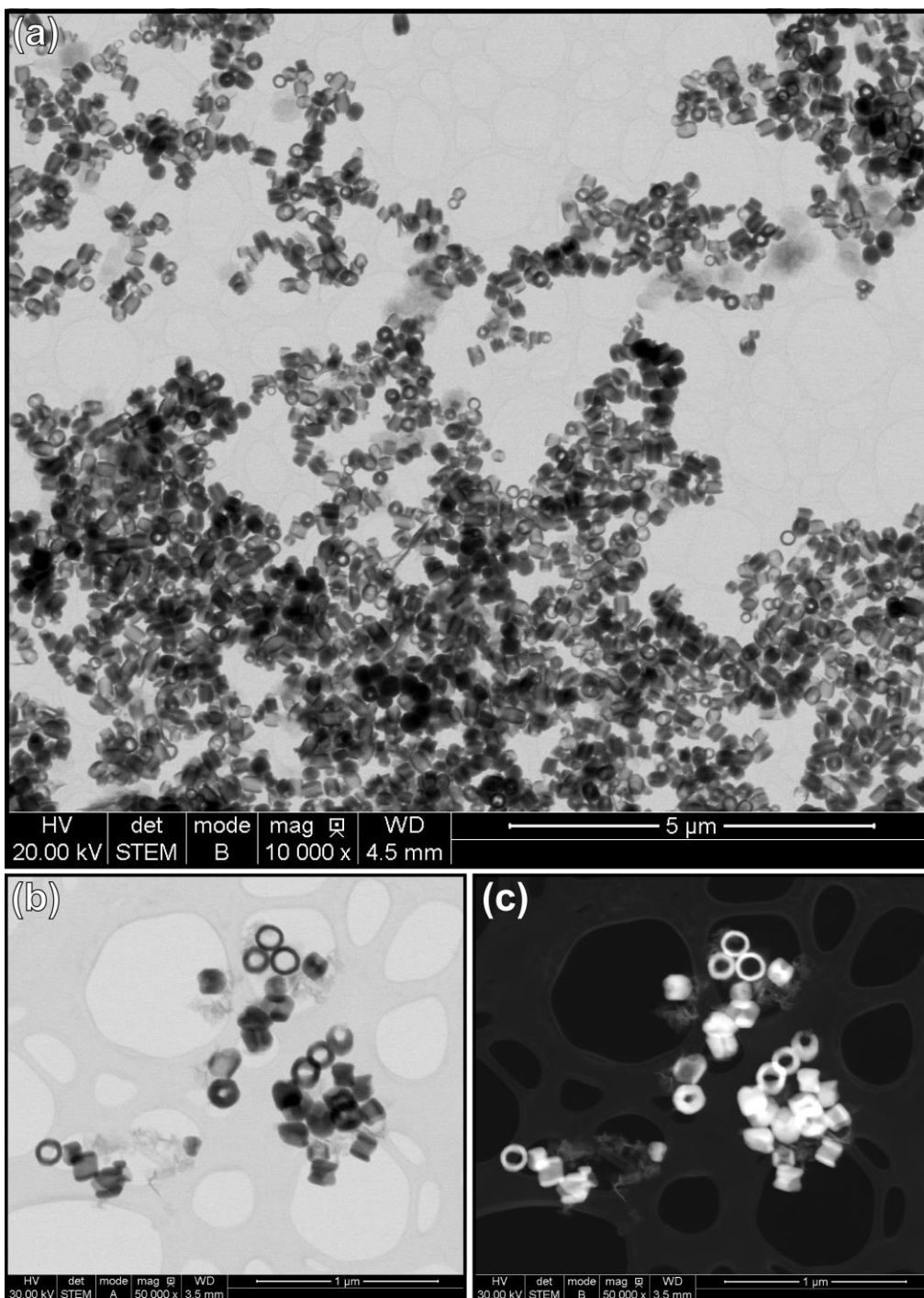


Figure S4. STEM images of the IONRs after chemical precipitation of $\text{Co}(\text{OH})_2$ NPs on its surface. (a) Low magnification image showing the homogeneous distribution of nanorings and some “shadows” corresponding to Co agglomerated regions. (b) Bright and (c) dark field images evidencing the presence of two regions, one containing IONRs with $\text{Co}(\text{OH})_2$ NPs its surface and other containing only the $\text{Co}(\text{OH})_2$ NPs probably due to the excess of CoCl_2 during the chemical precipitation process.

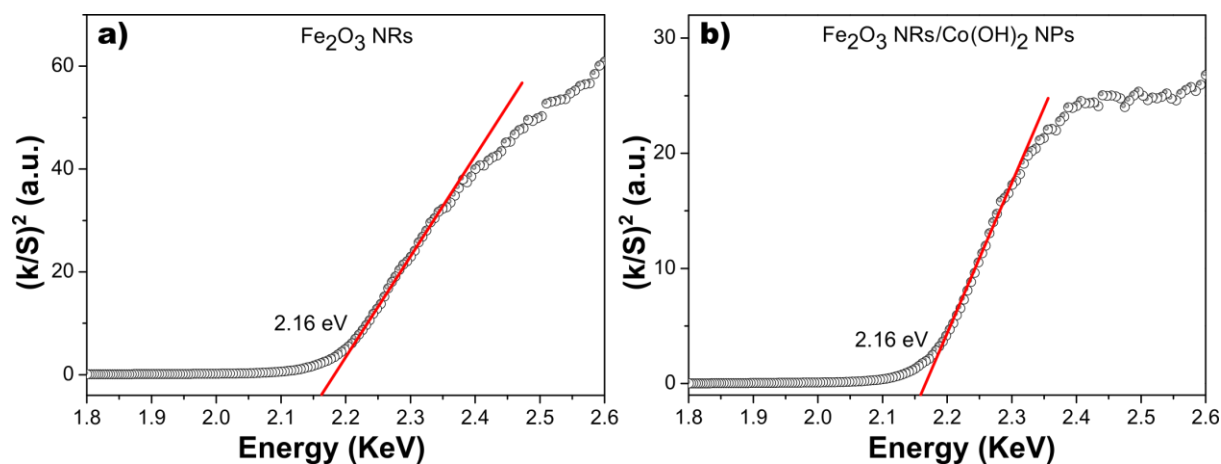


Figure S5. $(k/S)^2$ vs. Energy plot of the diffuse UV-Vis reflectance spectra obtained for the $\alpha\text{-Fe}_2\text{O}_3$ NRs (a) and Co(OH)_2 coated $\alpha\text{-Fe}_2\text{O}_3$ NRs. The absorption data could be calculated from the Kubelka-Munk function $(\alpha/S) = (1 - R)^2/2R$, where R is the reflectance at a given wavelength, and α and S are the absorption and scattering coefficients. The optical band gap was obtained by extrapolating the intercept from the step absorption edge in the plot $(\alpha/S)^2$ vs. $h\nu$, following literature [V. Derstroff, et. al. Anorg. Allg. Chem. 2002, 628, 1346].

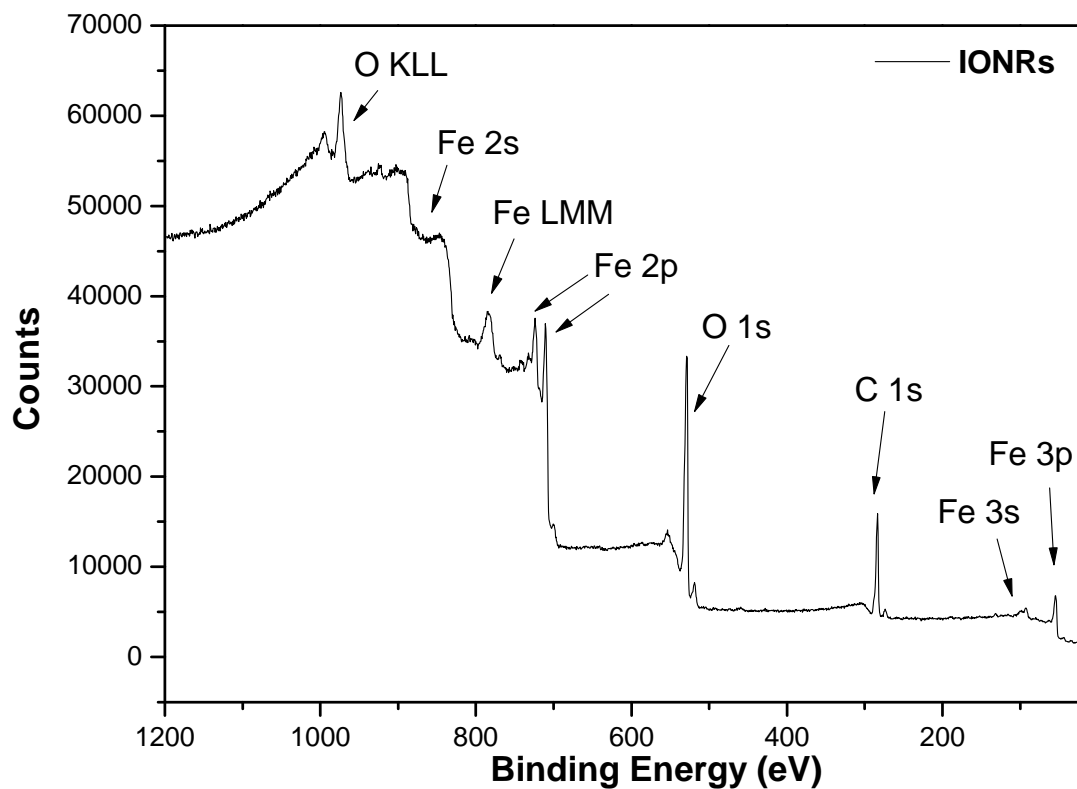


Figure S6. XPS survey spectra of the IONRs prepared by hydrothermal reaction for 48 h. The result shows that there is no contamination on the surface of the nanorings. The C 1s signal is originated from the carbon tape where the powder was fixed.