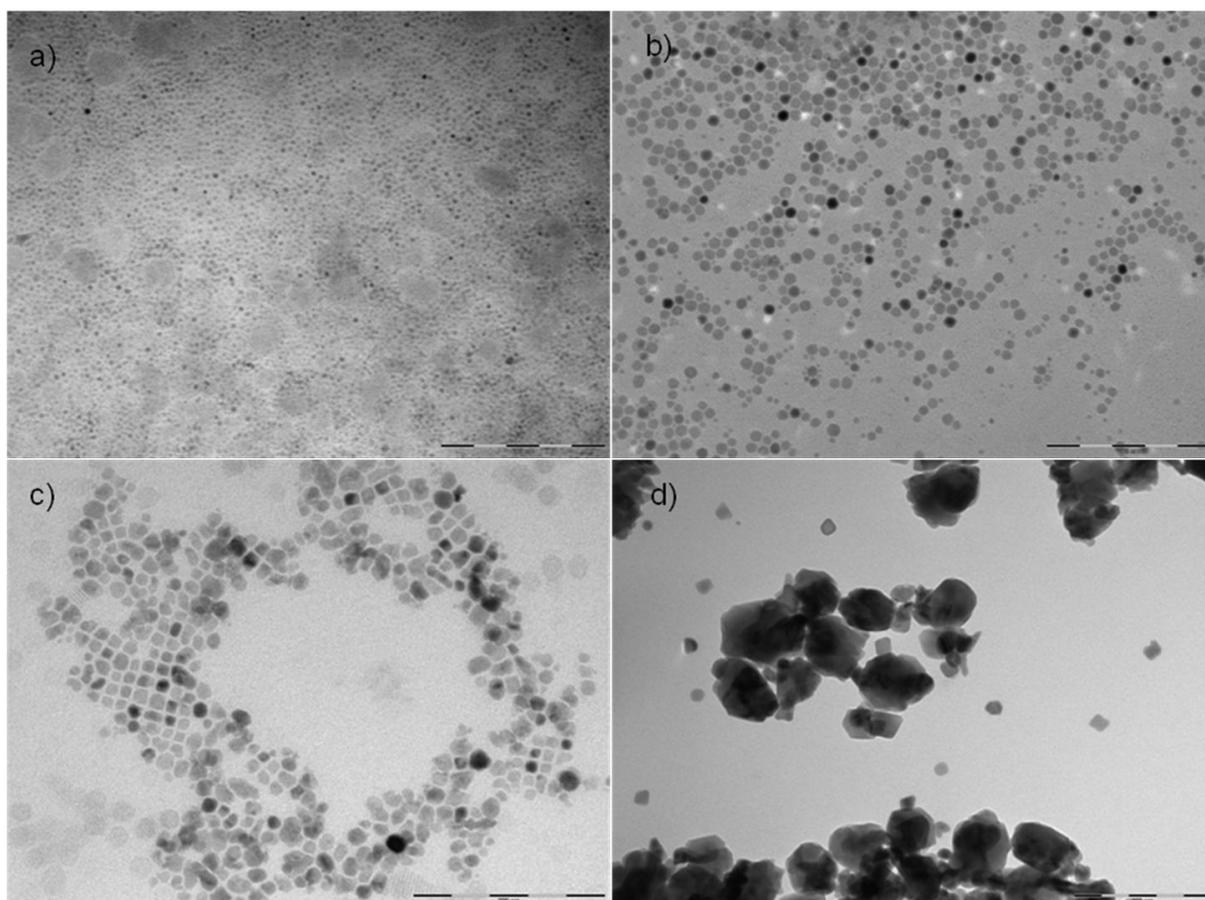


## SUPPORTING INFORMATION

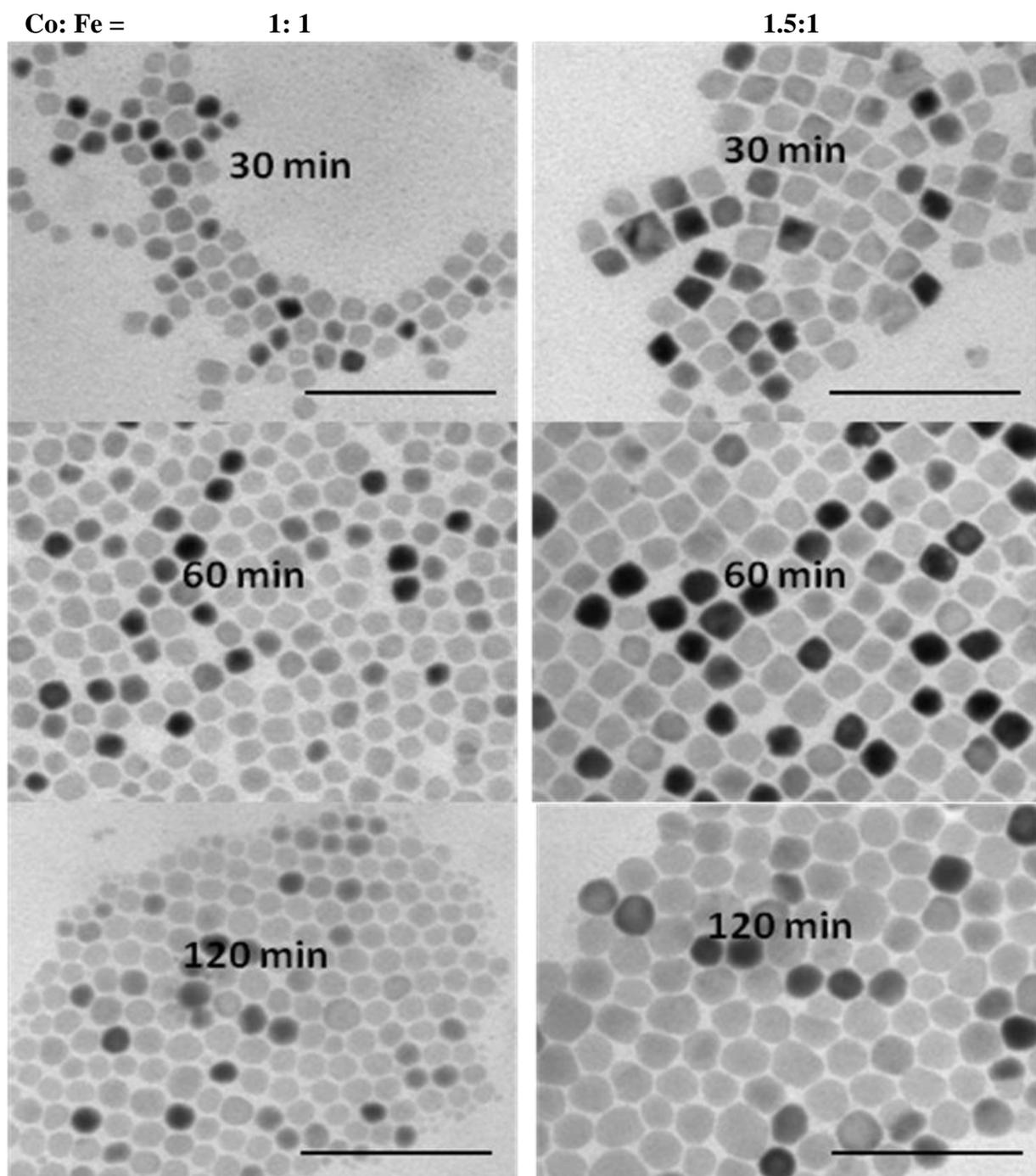
### **Synthesis of magnetic cobalt ferrite nanoparticles with controlled morphology, monodispersity and composition: the influence of solvent, surfactant, reductant and synthetic condition**

***Le T. Lu<sup>a\*</sup>, Ngo T. Dung<sup>a</sup>, Le D. Tung<sup>b</sup>, Cao T. Thanh<sup>c</sup>, Ong K. Quy<sup>d</sup>, Nguyen V. Chuc<sup>c</sup>, Shinya Maenosono<sup>e</sup> and Nguyen T. K. Thanh<sup>b\*</sup>***

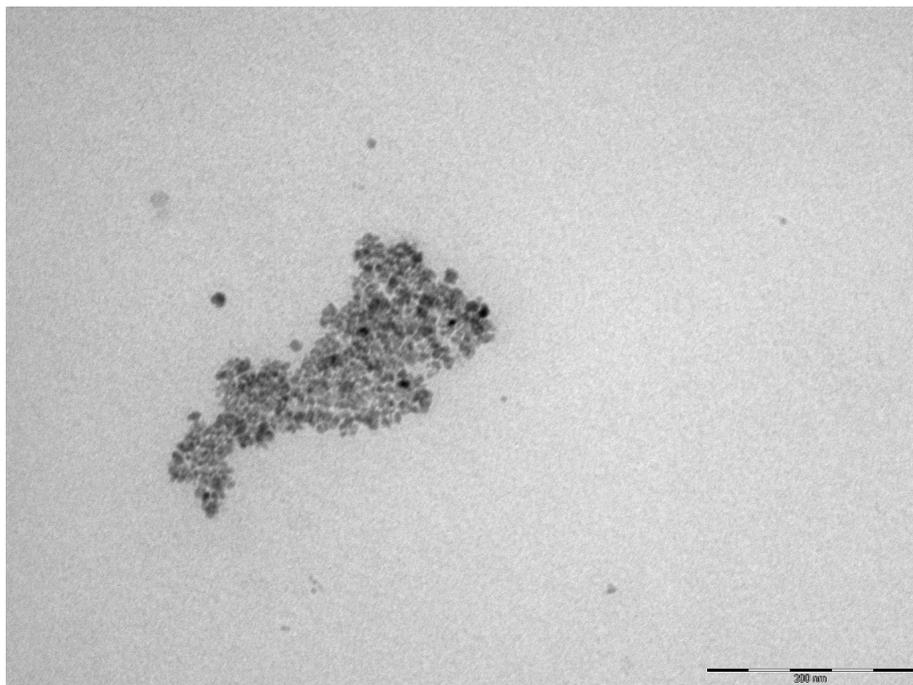
*<sup>a</sup>Institute for Tropical Technology -Vietnam Academy of Science and Technology ,18 Hoang Quoc Viet, Cau Giay, Hanoi, Vietnam. <sup>b</sup>Biophysics Group, Department of Physics and Astronomy, University College London, Gower Street, London WC1E 6BT, UK. <sup>c</sup>Institute of Materials Science, Vietnam Academy of Science and Technology, 18 Hoang Quoc Viet, Cau Giay, Hanoi, Vietnam. <sup>d</sup>Institute of Materials, Ecole Polytechnique Federale de Lausanne, Lausanne, Switzerland. <sup>e</sup>School of Materials Science, Japan Advanced Institute of Science and Technology, 1-1 Asahidai, Nomi, Japan.*



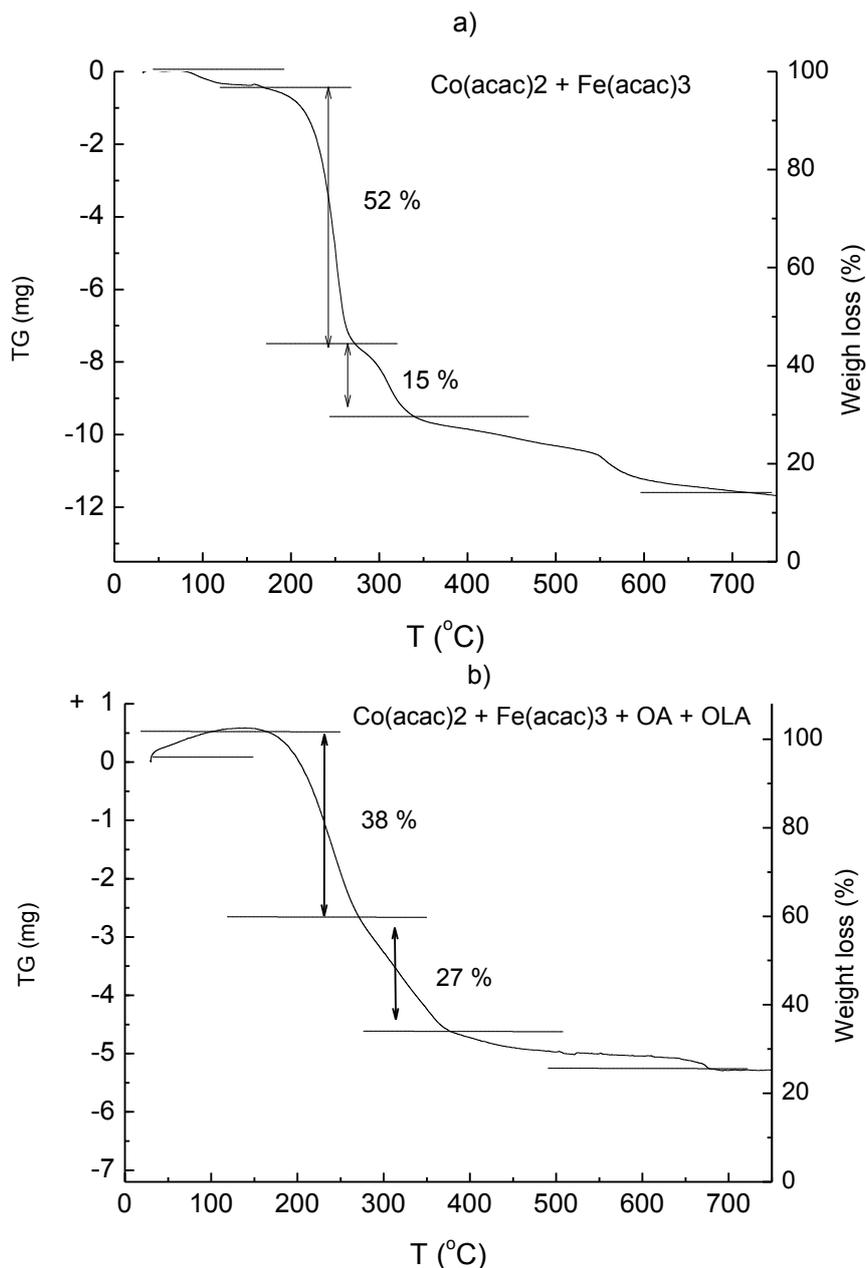
**Figure S1:** TEM images of the cobalt ferrite NPs synthesised in di-octyl ether with the precursor ratio  $\text{Co}^{2+} : \text{Fe}^{3+} = 1 : 2$  under equimolar amount of OA/OLA at total concentration of 248 (a, b) and 620 mM (c,d); and different reaction times: 5 (a,c) and 120 min (b,d). Scale bar: 200 nm.



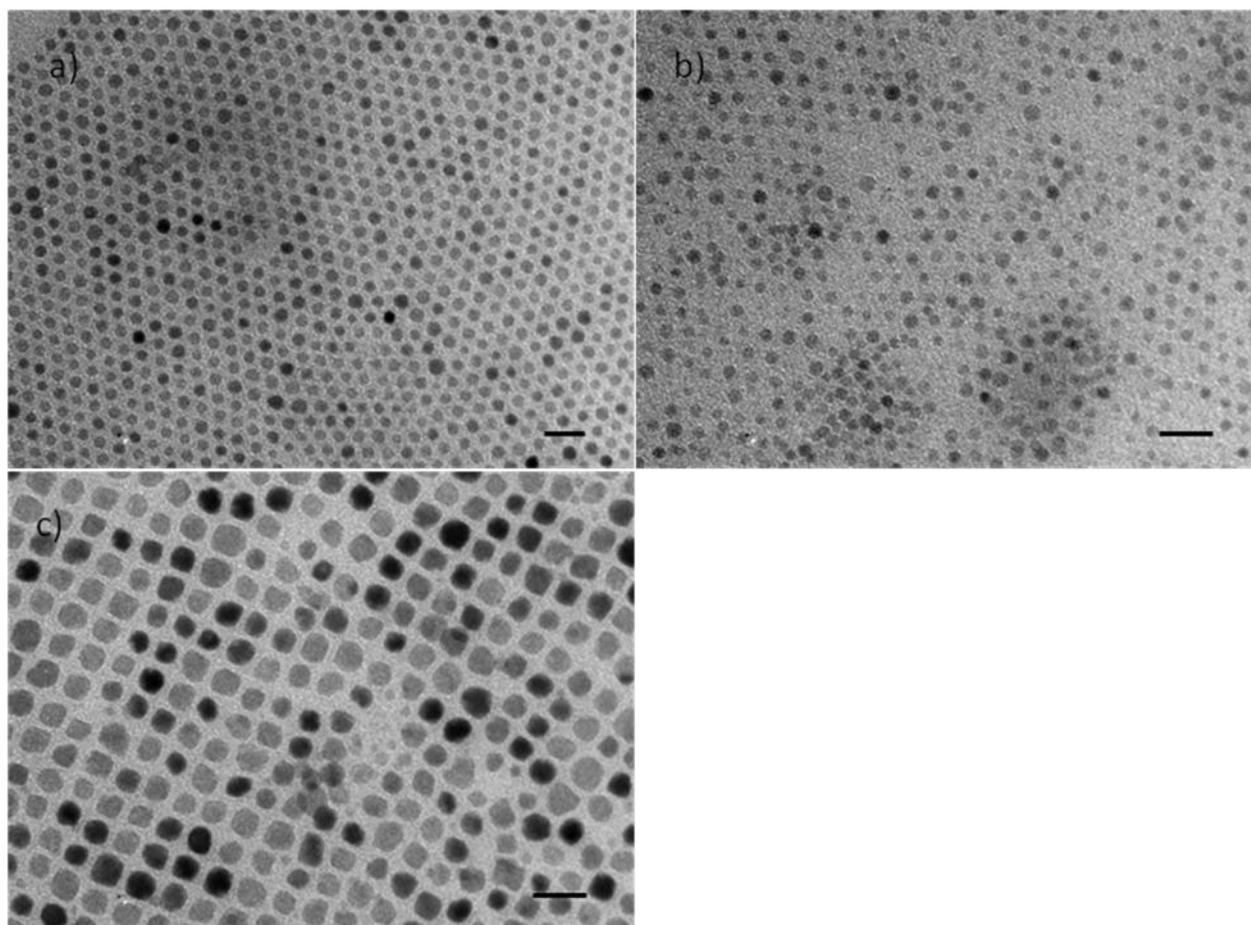
**Figure S2:** TEM images of NPs synthesised in dioctyl ether with a total concentration of equimolar amount of OA and OLA at 240 mM at ratio of Co: Fe = 1: 1 (left ) and 1.5: 1 (right) and different reaction times. Scale bar: 200 nm.



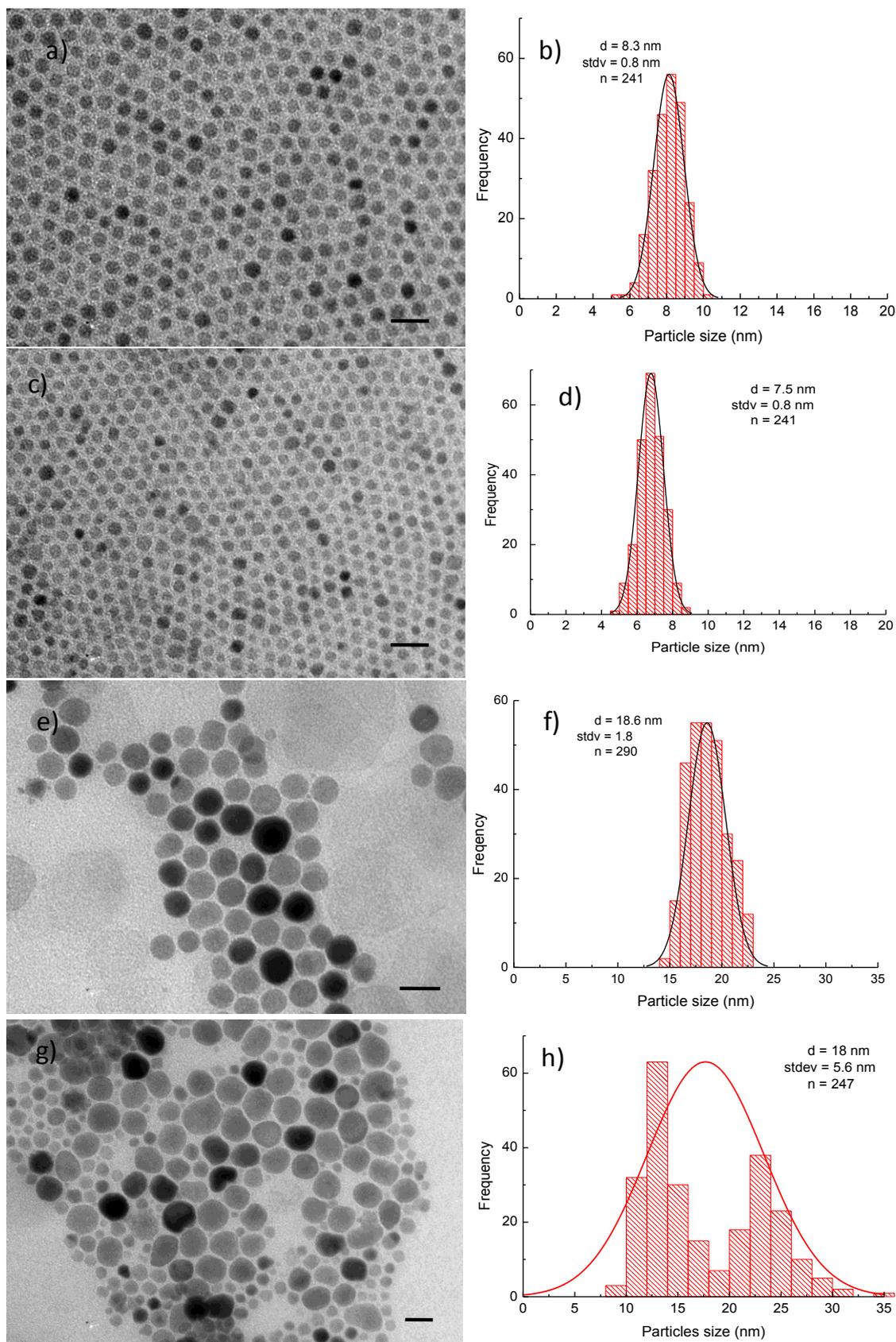
**Figure S3:** TEM images of the cobalt ferrite NPs synthesised in the presence of equimolar amount of OA/OLA at the total concentration of 2.4 M. The starting precursor ratio  $\text{Co}^{2+} : \text{Fe}^{3+} = 1 : 1.5$  and the reaction time is 30 min. Scale bar: 200 nm.



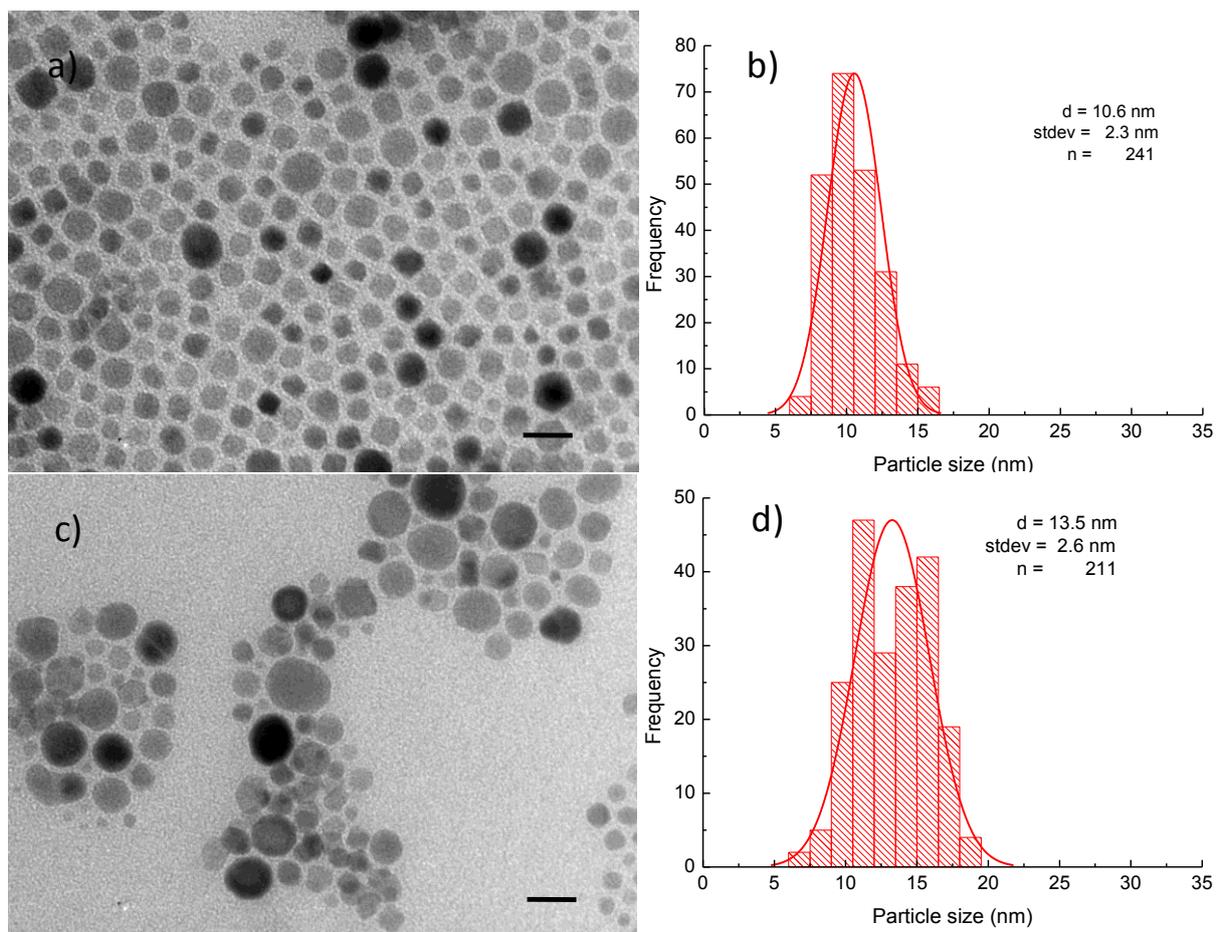
**Figure S4:** TGA measurements: **a)** metal acetylacetonate compounds (1  $\text{Co}(\text{acac})_2 + 2 \text{Fe}(\text{acac})_3$  and **b)** metal-acac compounds in the presence of OA and OLA (1  $\text{Co}(\text{acac})_2 + 2 \text{Fe}(\text{acac})_3 + \text{OA} + \text{OLA}$ ).  $[\text{OA}] = [\text{OLA}] = 310 \text{ mM}$ . TGA plots were recorded at a constant heating rate of  $10 \text{ }^\circ\text{C}/\text{min}$  under nitrogen atmosphere.



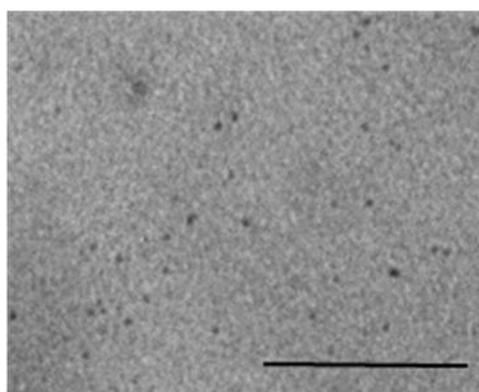
**Figure S5:** TEM images of the cobalt ferrite NPs synthesised in the presence of equimolar amount of OA/OLA concentration of 372 mM (186 mM each) at different starting precursor  $\text{Co}^{2+}$ :  $\text{Fe}^{3+}$  ratios: a) 1: 2, b) 1: 1.5 and 1.5: 1. The reaction time is 60 min. Scale bar: 20 nm.



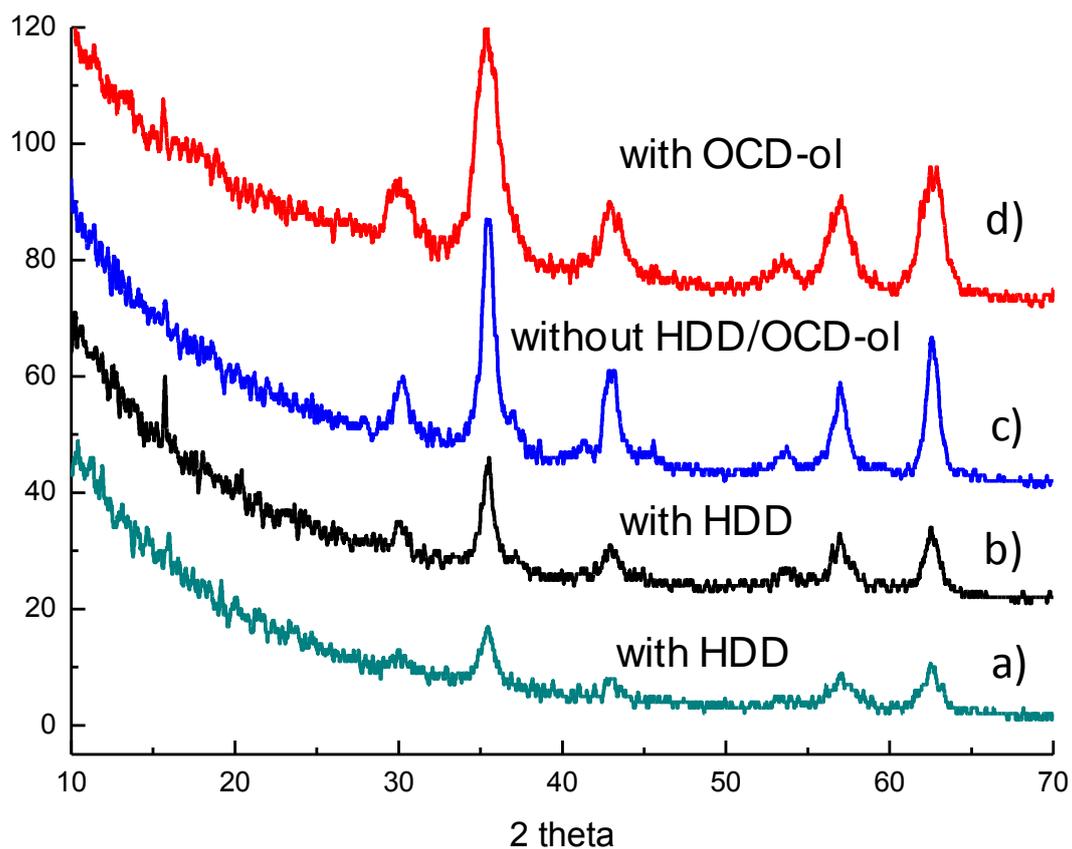
**Figure S6:** TEM images and size distribution histograms of the NPs synthesised in the presence of 496 mM OA/OLA (248 mM each) with HDD (a-d) and without (e-h) for 60 min (a,b,e,f) and 120 min (c,d,g,h). Scale bar: 20 nm.



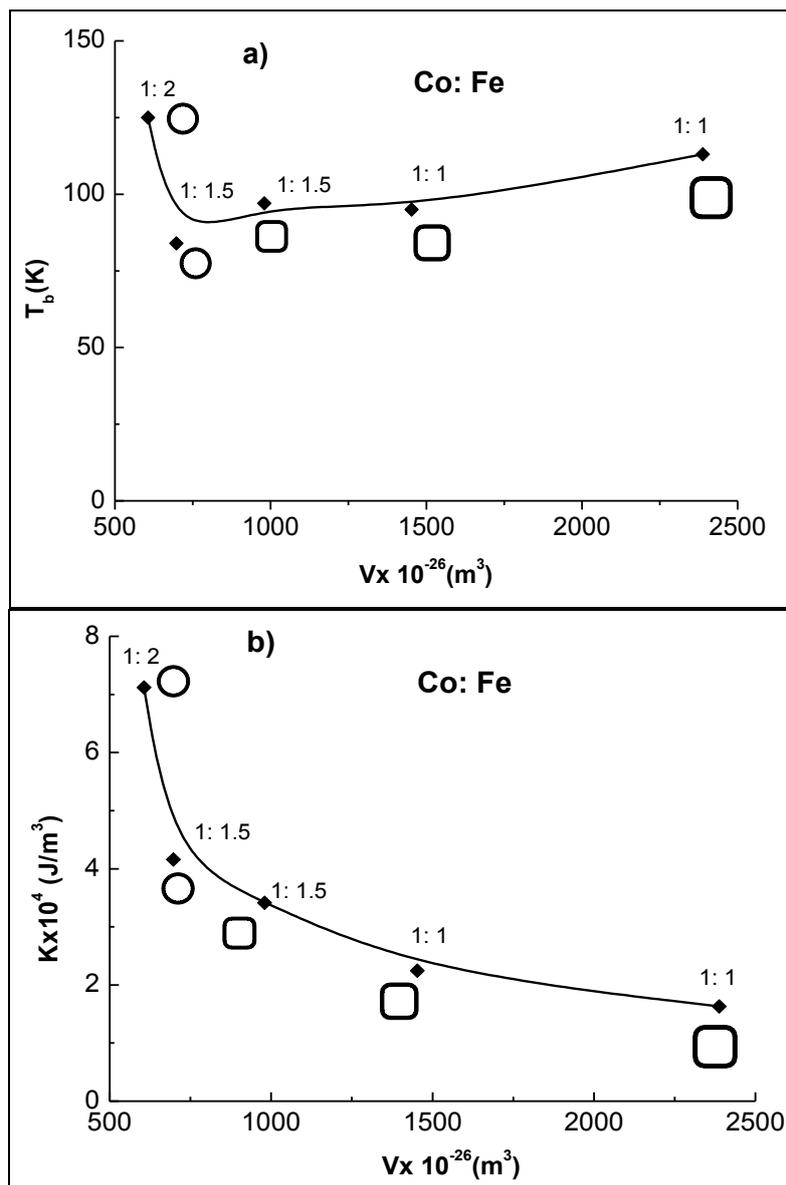
**Figure S7:** TEM images and size distribution histograms of the NPs synthesised in the absence of HDD and at 372mM OA/OLA (186 mM each) (a,b) and 744 mM (372 mM (c,d) for 60 min. Scale bar: 20 nm.



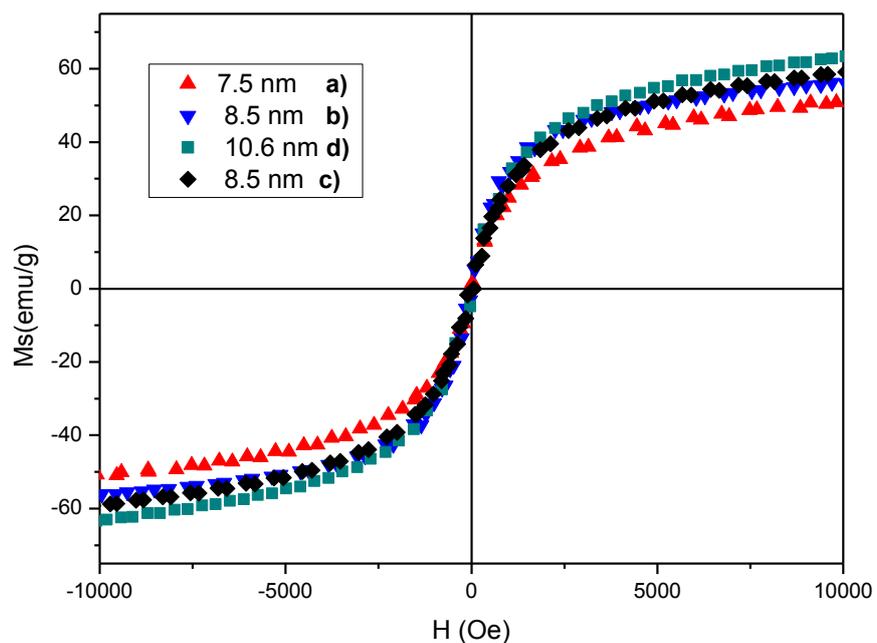
**Figure S8:** TEM image of cobalt ferrite NPs synthesised in the presence of sole 620 mM OA for 30 min. Scale bar: 100 nm



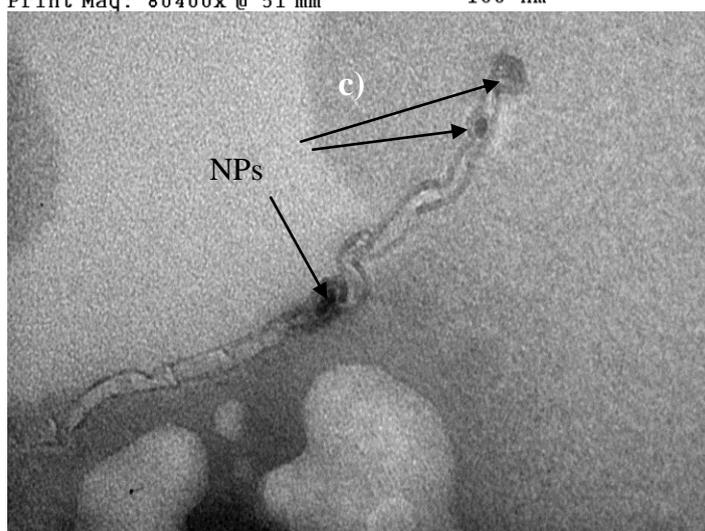
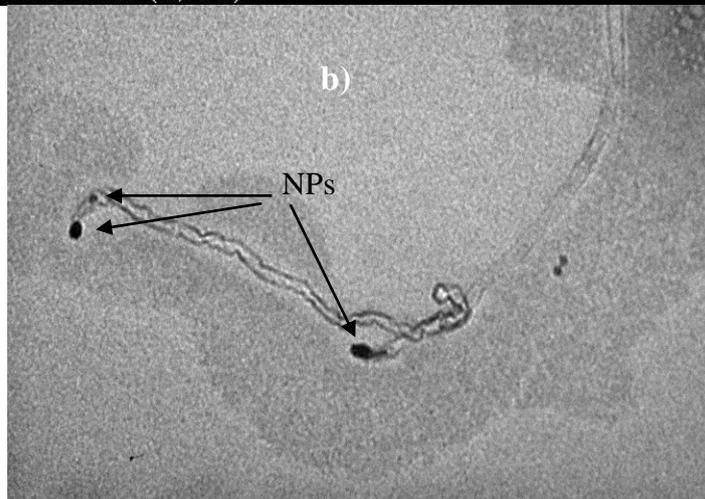
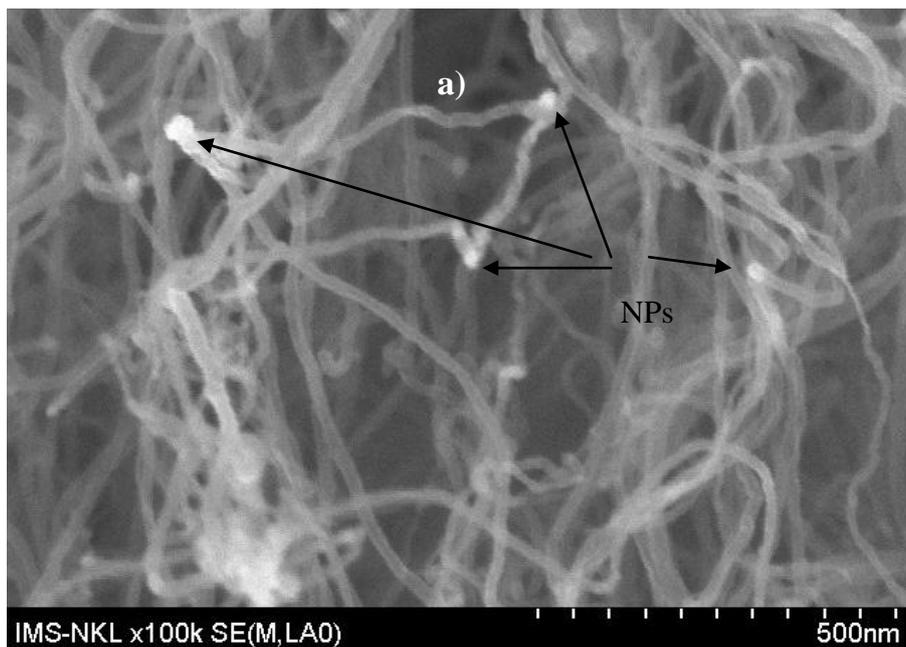
**Figure S9:** XRD patterns of some cobalt ferrite nanoparticles synthesised under different synthetic conditions: a,b) in the presence of HDD with 248 mM equimolar OA/OLA for 60 min (a) and 120 min (b); c) in the absence of HDD/OCD-ol and 744 mM OA/OLA (372 mM each) for 60 min; d) in the presence of OCD-ol and 186 mM OLA for 30 min.



**Figure S10:** The plot of blocking temperature  $T_b$  (a) and magnetocrystalline anisotropy constant  $K$  of them samples prepared at different Co: Fe ratios (1: 2, 1: 1.5 and 1: 1) vs. the average volume of the nanoparticles.



**Figure S11:** Hysteresis curves of  $\text{CoFe}_2\text{O}_4$  NPs with different size synthesized under different reaction conditions: a,b) in the presence of OCD-ol in octadecene with 186 mM OA for 30 min (a) and 248 mM equimolar OA/OLA for 60 min (b); c) the presence of HDD and 124 mM equimolar OA/OLA for 30 min in dioctyl ether; d) in the absence of HDD/OCD-ol and 248 mM equimolar OA/OLA for 60 min.



**Figure S12:** High magnification SEM (a) and TEM images of CNTs grown on the 4.9 nm cobalt ferrite NPs coated Si/SiO<sub>2</sub>.