SUPPORTING INFORMATION

Effect of environment medium and the *in situ* formation of precursor on the composition-shape of iron oxide nanoparticles synthesized by thermal decomposition method

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Figure S1: TGA curves of iron stearate (black line) and iron oleate (red line) carried out under air with a heating rate of 5°C/min.
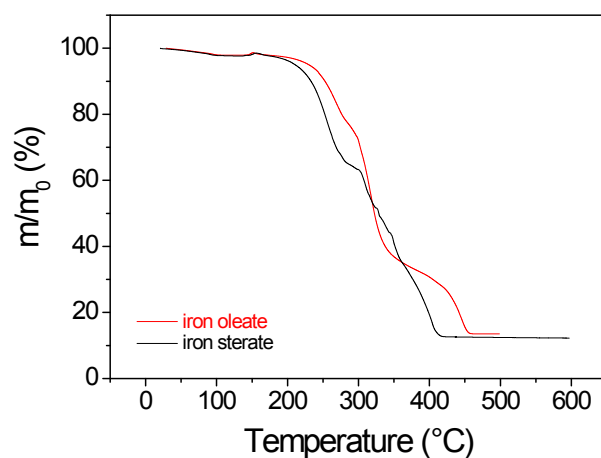

Table S1 : 1/d(*hkl*) measured from the electronic diffraction pattern in Fig. 2e, corresponding d(*hkl*), (*hkl*) plans and theoric d(*hkl*) of magnetite (JCPDS card n° 00-019-0629).

1/d$_{(hkl)}$ measured (Å^{-1})	d$_{(hkl)}$ measured (Å)	(*hkl*)	d$_{(hkl)}$ of Fe$_3$O$_4$ (Å)
0.322	3.11	(220)	2.965
0.376	2.66	(311)	2.529
0.450	2.22	(400)	2.097
0.585	1.71	(422)	1.924
0.633	1.58	(511)	1.614
0.734	1.36	(440)	1.483
0.774	1.29	(533)	1.279
0.856	1.17	(444)	1.211
0.889	1.12	(731)	1.092

Table S2 : 1/d(*hkl*) measured from the electronic diffraction pattern in Fig. 2f, corresponding d(*hkl*), (*hkl*) plans and theoric d(*hkl*) of magnetite (JCPDS card n° 00-019-0629) and wustite (JCPDS card n° 00-006-0615).

1/d$_{(hkl)}$ measured (Å^{-1})	d$_{(hkl)}$ measured (Å)	Magnetite Fe$_3$O$_4$			Wüstite FeO	
		(*hkl*)	Theorical d$_{(hkl)}$ (Å)	(*hkl*)	Theorical d$_{(hkl)}$ (Å)	
0.67	1.49	(440)	1.483	(220)	1.523
0.63	1.58	(511)	1.614		
0.474	2.11	(400)	2.097	(200)	2.153
0.4	2.5	(311)	2.529	(111)	2.49
0.341	2.93	(220)	2.965		

Figure S2: DRX pattern of nanoparticles NSC16, refined with considering spinel and wustite components (on top) and considering just one spinel phase (down).
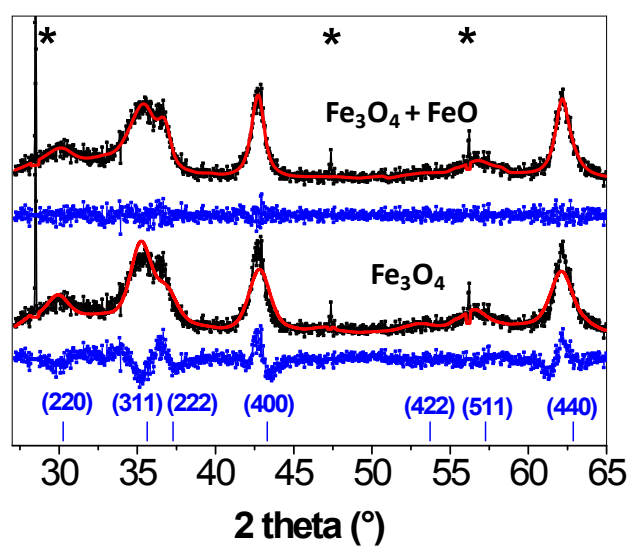
Figure S3: [57]Fe Mössbauer spectra measured at 300 K of NSH11 (A), at 77 K of NSH11 and NSH16 (B,C) and at 11 K under a magnetic field of 8 T of NSH11 (D).
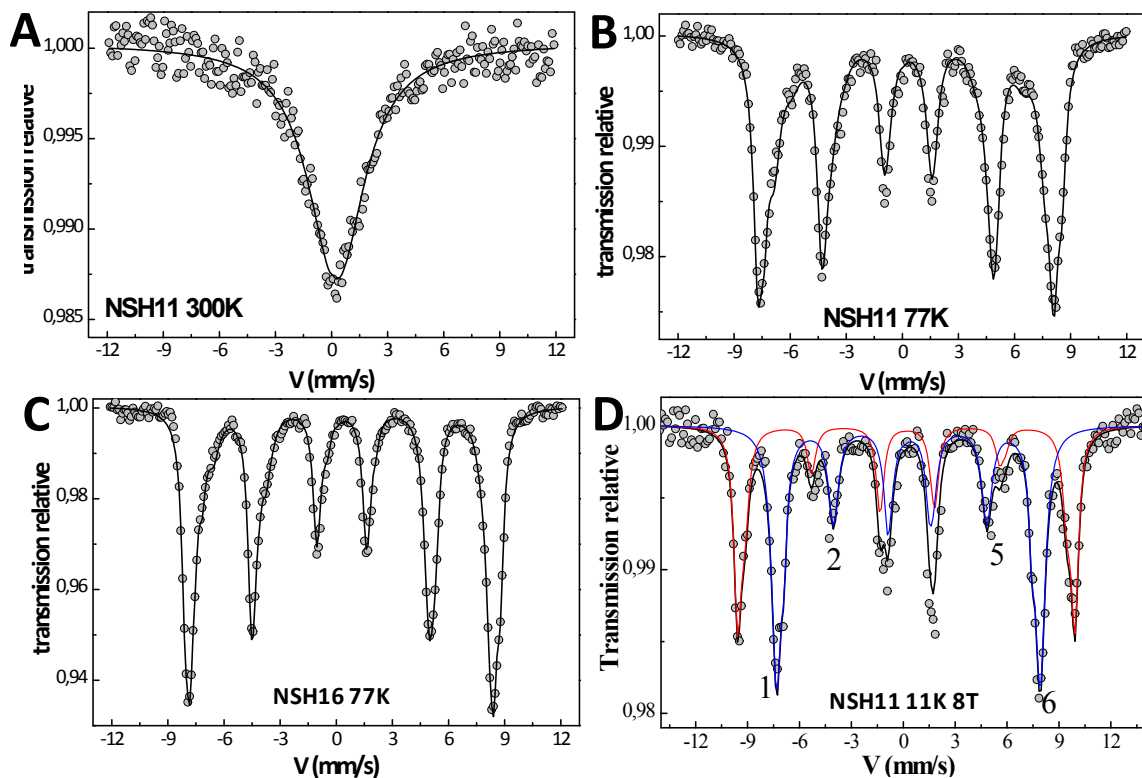

Figure S4: Magnetization curves as function of an applied field at at 5 K after cooling without (ZFC) and with (FC) an applied field of 4 T of nanoparticles NSH11 and NSC11.
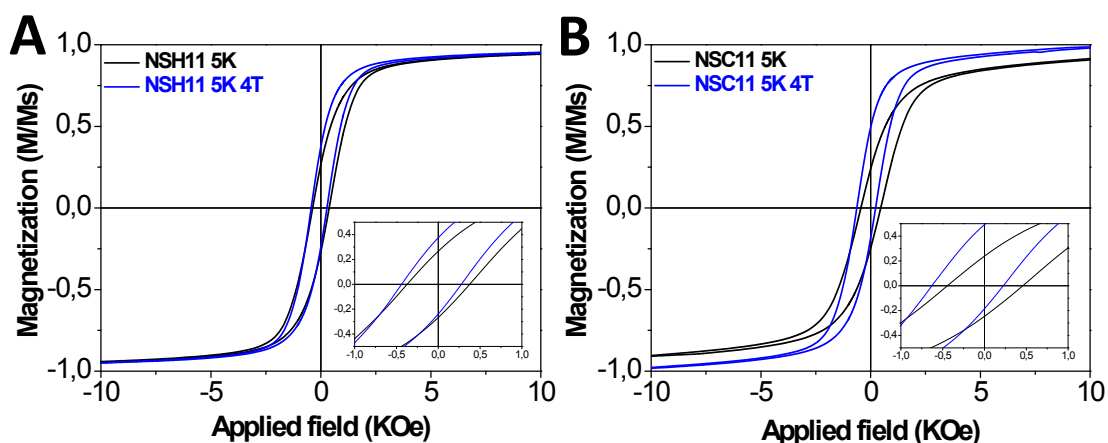
Figure S5: Iron oxide NPs synthesized from the thermal decomposition of iron stearate in similar conditions described in the paragraph 2.2.1.
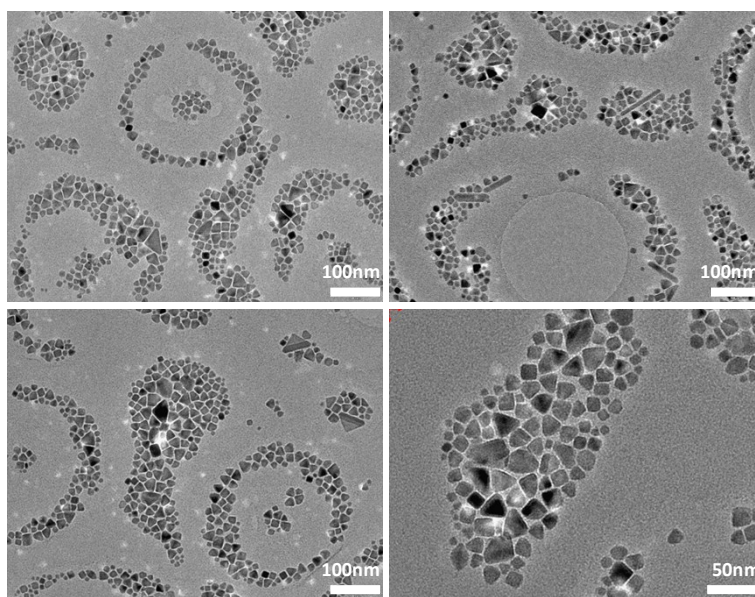

Figure S6: [57]Fe Mössbauer spectra of nanoparticles NCH14 measured at 300 K (A) and 77 K (B).
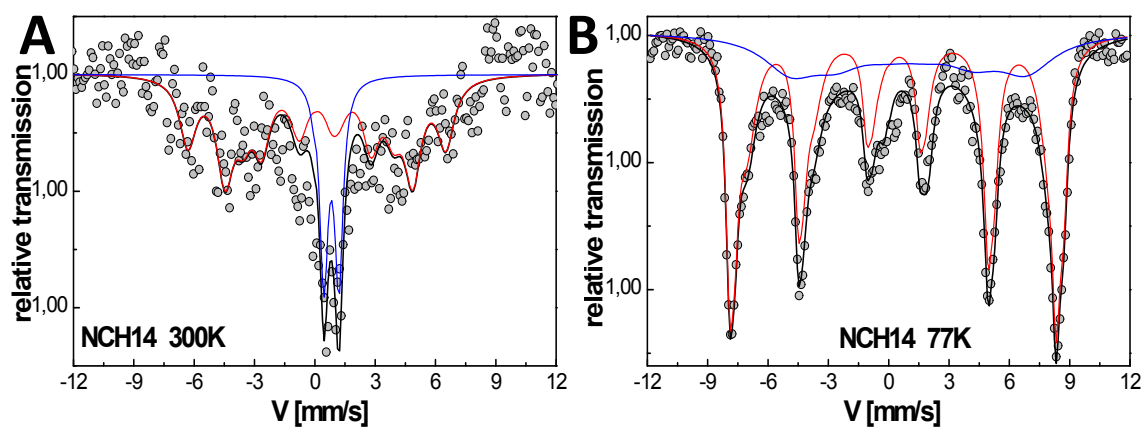
Figure S7: Magnetization curves as function of an applied field at 5 K after cooling without (ZFC) and with (FC) an applied field of 4 T of nanoparticles NCC16.
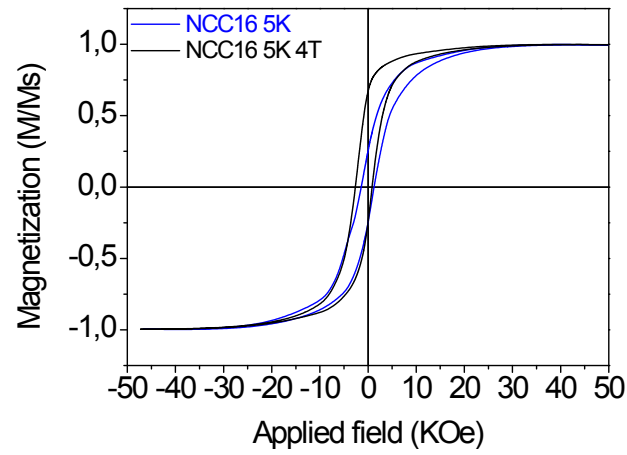

Table S3: Values of the exchange field (H_E) of nanoparticles NCH14 as a function of the temperature measured from the magnetization curves present in Fig.11.

Temperature (K)	Exchange Field HE (Oe)
5	41,2
10	38,55
20	28,45
30	15,25
40	10,55
50	8,6