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

Supplementary Information

Tailored design of $Co_xMn_{1-x}Fe_2O_4$ nanoferrites: a new route for dual control of size and magnetic properties

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Table S1. Raman band parameters obtained by curve fitting of the Raman spectra and corresponding assignment

Material	$A_{1g}(1)$		$A_{1g}(2)$		$T_{2g}(1)$		$T_{2g}(2)$		$T_{2g}(3)$		E_g		P1[b]	
	$\bar{\upsilon}$ (cm^{-1})[a]	Area	$\bar{\upsilon}$ (cm^{-1})[a]	Area	$\bar{\upsilon}$ (cm^{-1})[a]	Area	$\bar{\upsilon}$ (cm^{-1})[a]	Area	$\bar{\upsilon}$ (cm^{-1})[a]	Area	$\bar{\upsilon}$ (cm^{-1})[a]	Area	$\bar{\upsilon}$ (cm^{-1})[a]	Area
Mn_M	679	543	614	824	540	493	449	201	163	27	287	72	336	122
$Co_{0.3}Mn_{0.7}$_M	663	540	603	628	540	165	460	534	166	12	278	65	339	135
$Co_{0.7}Mn_{0.3}$_M	672	410	605	558	540	280	463	780	167	15	278	36	328	72
Co_M	679	743	609	616	545	299	471	857	177	70	289	286	370	42
Mn_Na	680	584	624	697	565	1121	453	230	168	14	292	78	348	192
$Co_{0.3}Mn_{0.7}$_Na	648	253	597	810	542	259	453	399	167	17	284	119	341	38
$Co_{0.7}Mn_{0.3}$_Na	659	261	594	561	543	187	456	679	176	13	286	114	347	16
Co_Na	675	527	614	535	539	403	463	848	173	25	293	104	371	4

[a] Raman band position.
[b] Additional non-indexed Raman mode.

Table S2. Saturation magnetization values obtained by Langevin analysis of the experimental $M(H)$ curves

Sample	M_S^{Lan} (emu g^{-1})
Mn_M	55.0
$Co_{0.3}Mn_{0.7}$_M	60.7
$Co_{0.7}Mn_{0.3}$_M	52.5
Co_M	53.0

Figure S1. Particle size distribution histograms obtained from the analysis of TEM images. The solid line represents the log-normal distribution fits.

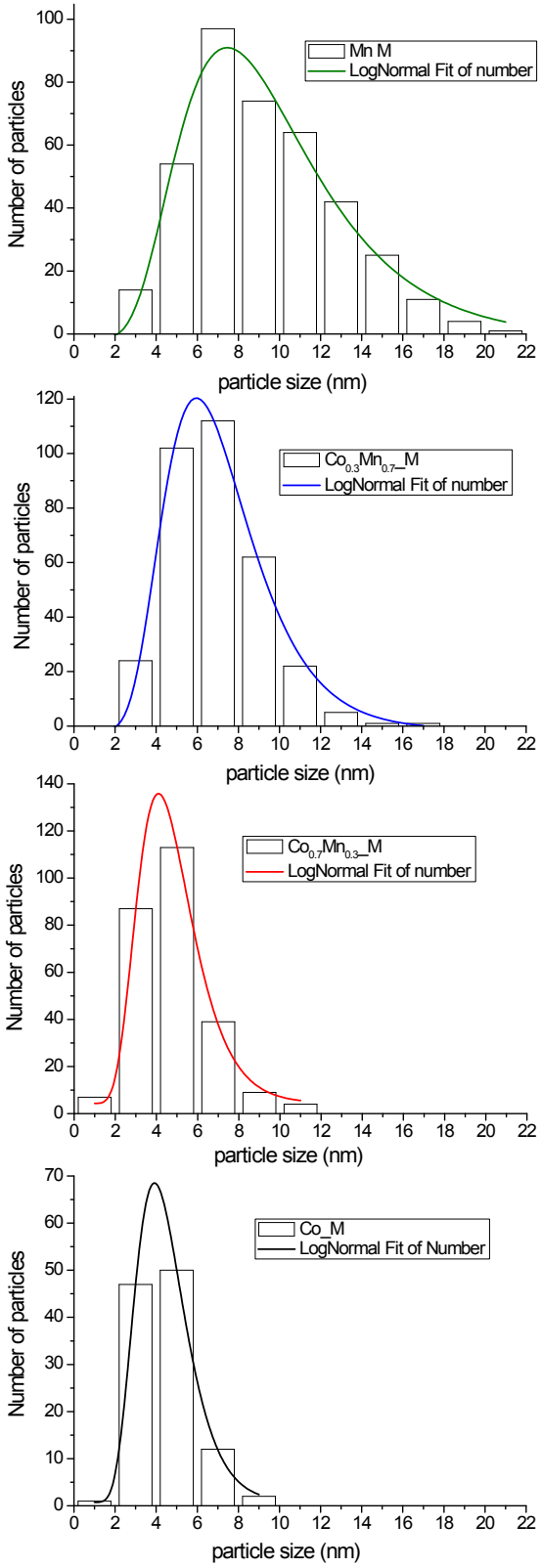


Figure S2. Powder XRD diffractograms of the $Co_xMn_{1-x}Fe_2O_4$ samples synthesized with MIPA (top) and NaOH (bottom), at room temperature.

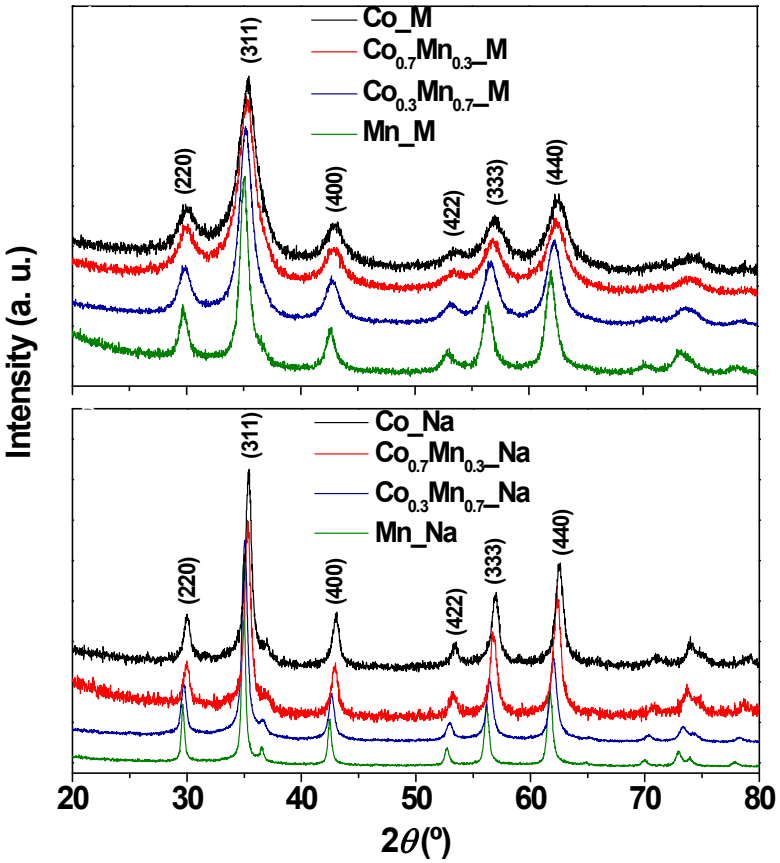


Figure S3. Plots of $\beta \cos \theta / K\lambda$ *versus* $4 \sin \theta / K\lambda$ plot of the $Co_xMn_{1-x}Fe_2O_4$ samples synthesized with (A) MIPA and (B) NaOH.

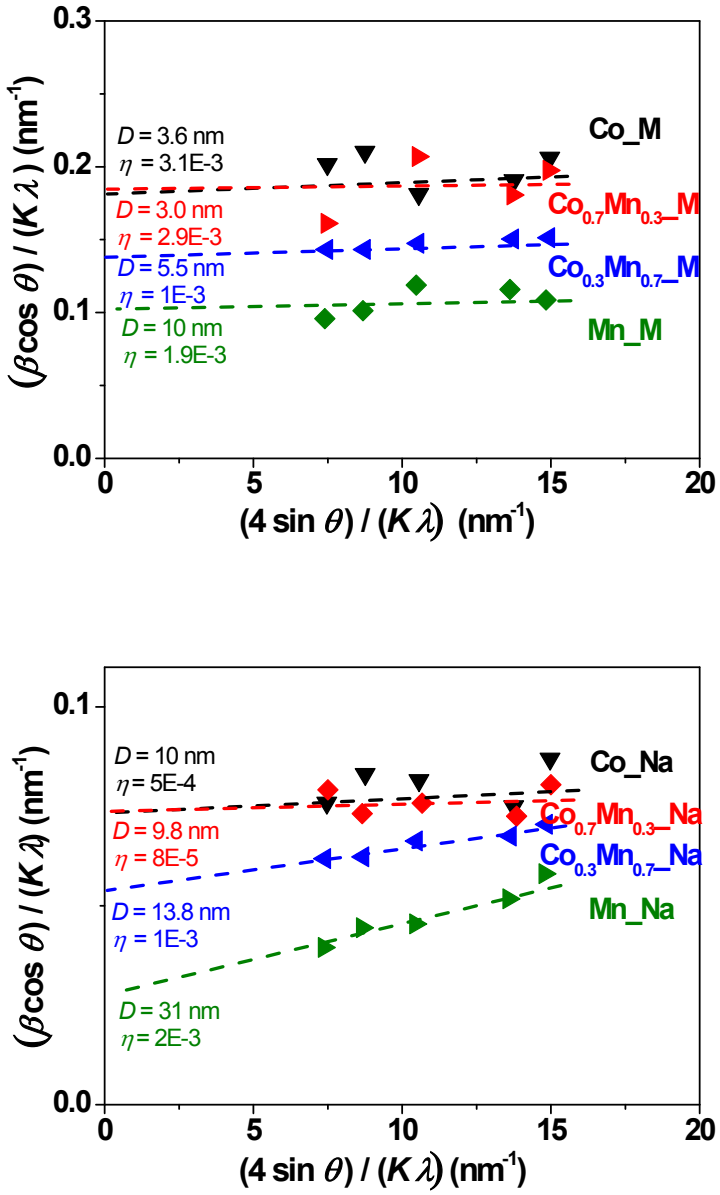
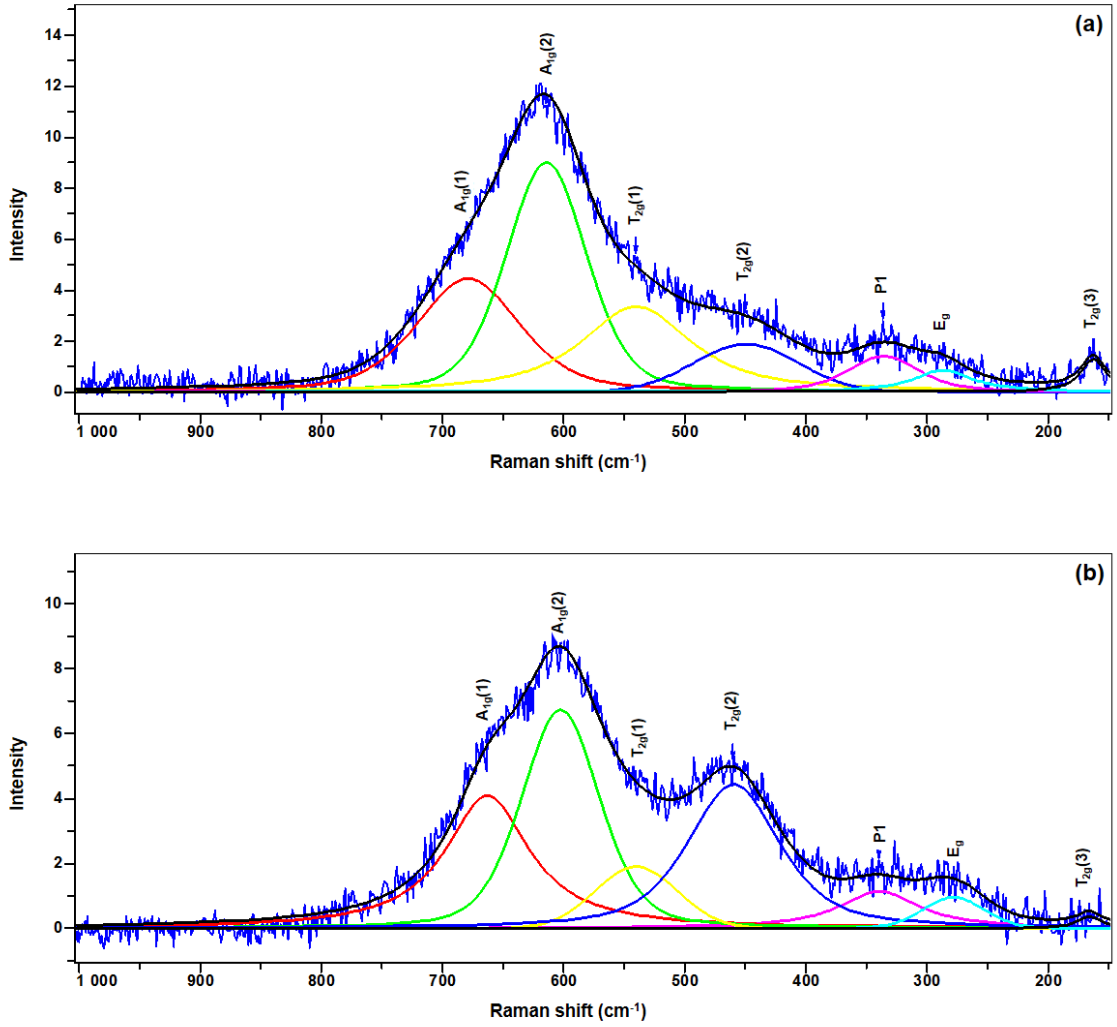
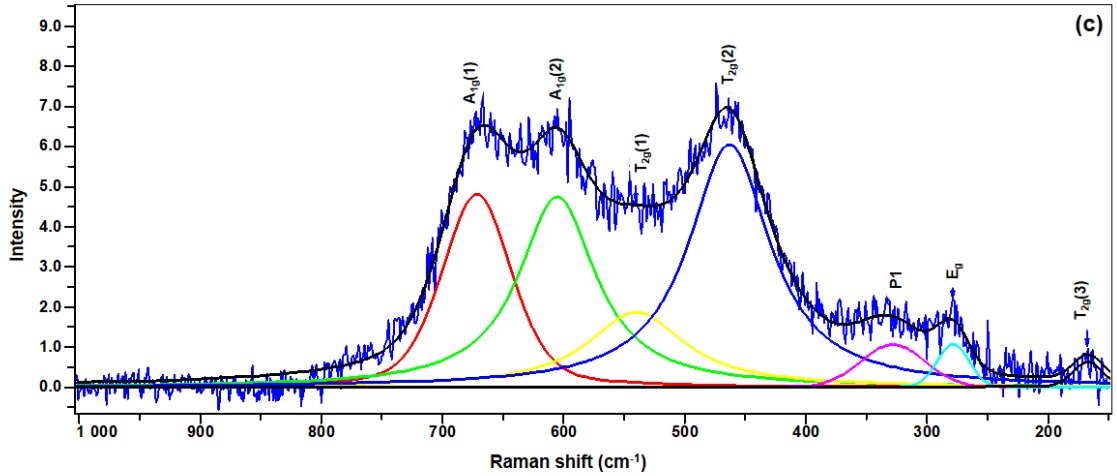


Figure S4. Deconvoluted Raman spectra of the $Co_xMn_{1-x}Fe_2O_4$ samples synthesized with MIPA, at room temperature: (a) Mn_M, (b) $Co_{0.3}Mn_{0.7}$_M, (c) $Co_{0.7}Mn_{0.3}$_M and (d) Co_M.




(c)
Intensity
Raman shift (cm-1)
A1g(1)
A1g(2)
T2g(1)
T2g(2)
P1
Eg
T2g(3)

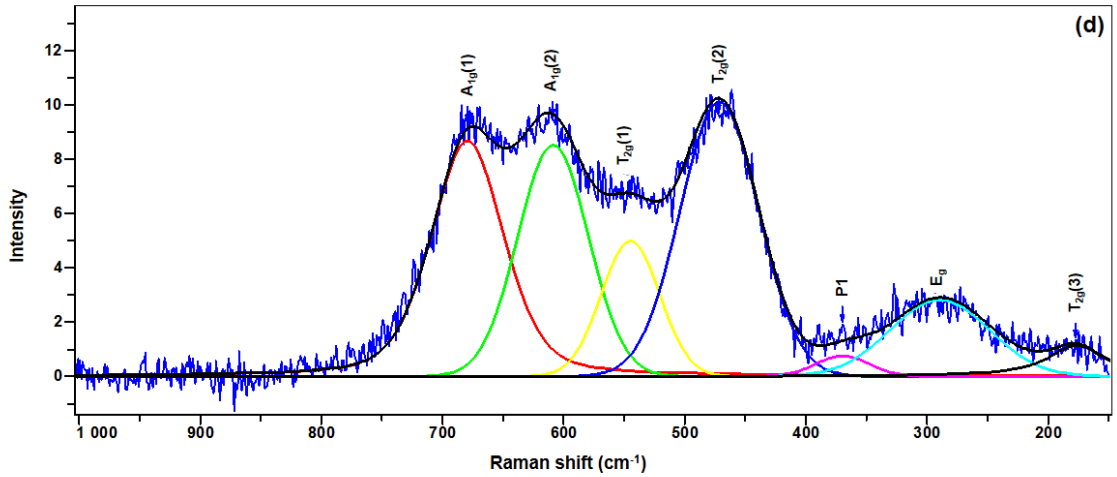

(d)
Intensity
Raman shift (cm-1)
A1g(1)
A1g(2)
T2g(1)
T2g(2)
P1
Eg
T2g(3)

Figure S5. FTIR spectra of $Co_xMn_{1-x}Fe_2O_4$ nanoparticles prepared with (A) MIPA and (C) NaOH. (B), (D) Magnified FTIR spectra in the 2000–400 cm^{-1} range.

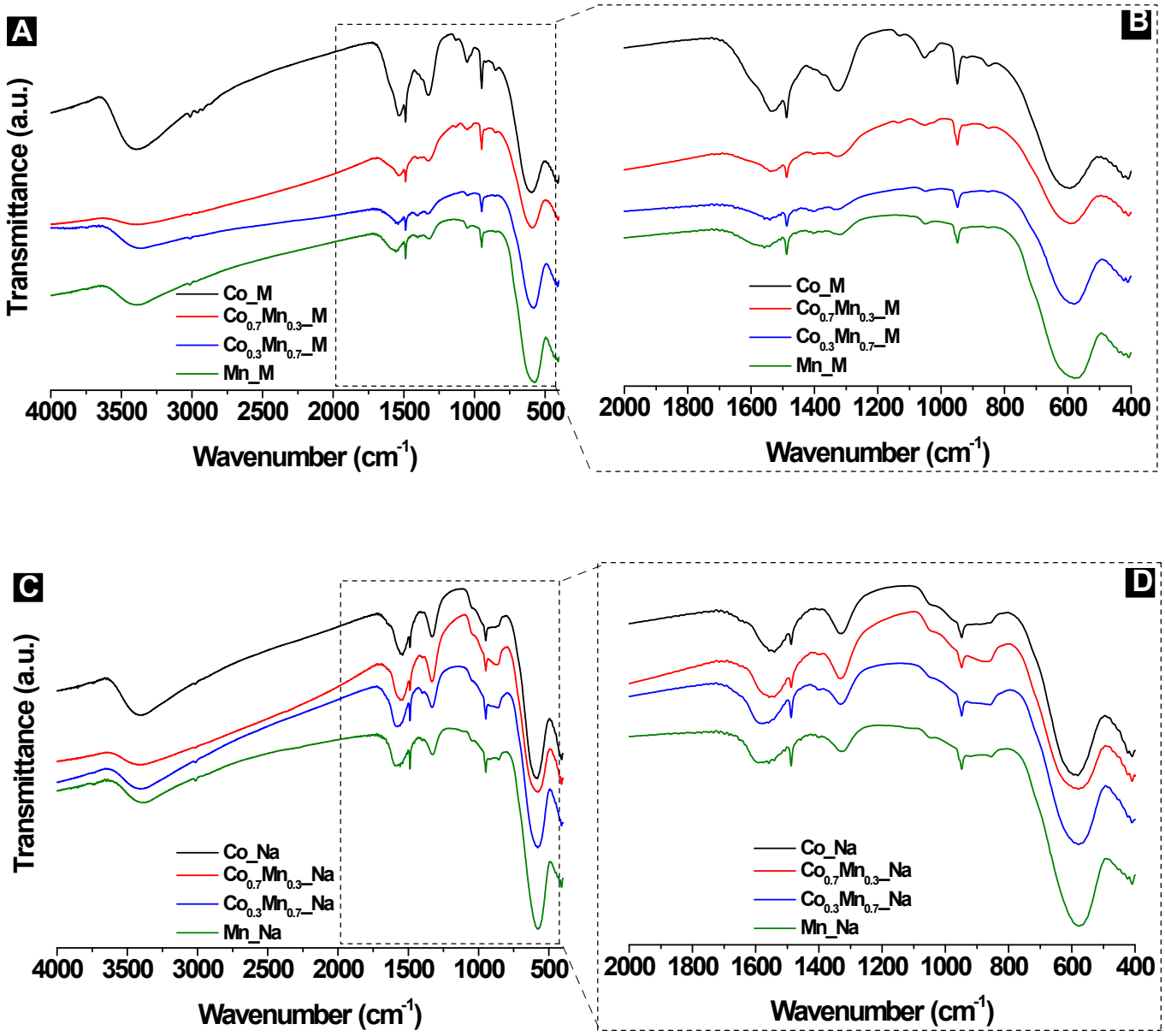


Figure S6. *M(H)* curves measured at 5 K for $Co_{0.3}Mn_{0.7}$_Na and $Co_{0.7}Mn_{0.3}$_Na samples. The arrows are pointing the kinks detected at low values of magnetic field (see text).