Electronic Supplementary Information

Rapid, Microwave-Assisted Synthesis of Gd_2O_3 and Eu:Gd_2O_3 Nanocrystals: Characterization, Magnetic, Optical and Biological Studies

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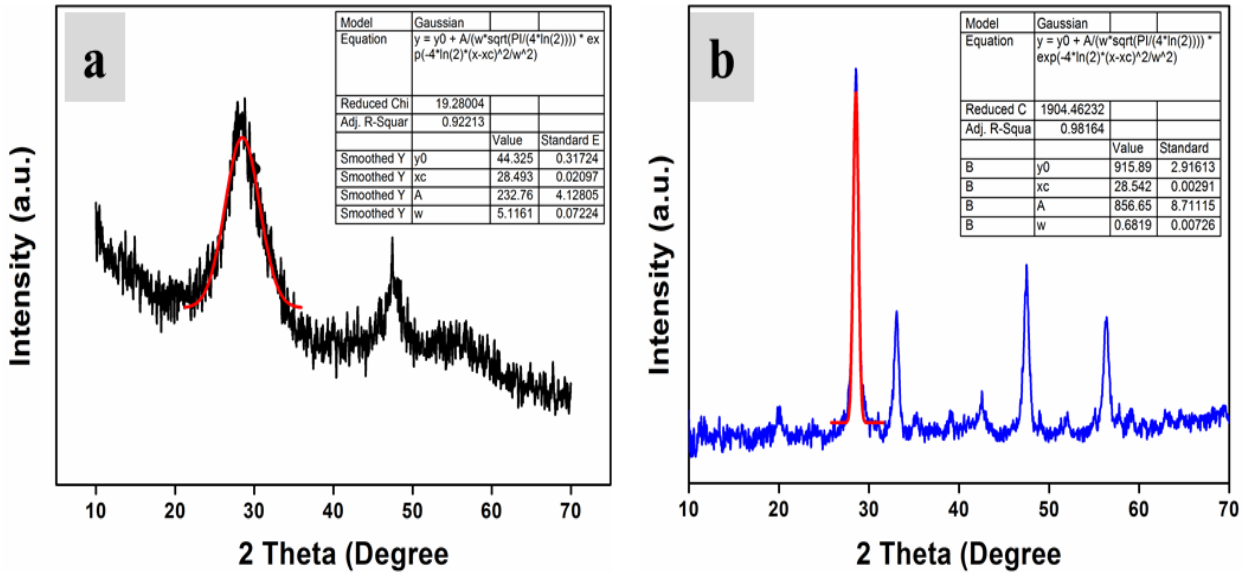


Fig. S1 A Gaussian fit of (222) reflection to calculate the FWHM for as-prepared (a) and annealed Gd_2O_3 nanopowders (b). A full-width-at-half-maximum (FWHM) of 5.11° was obtained for as-prepared material, whereas a value of 0.68° was obtained for Gd_2O_3 powder sample annealed at 600 °C in air for 2 hours, giving a crystallite size of 2 nm and 12 nm, respectively.

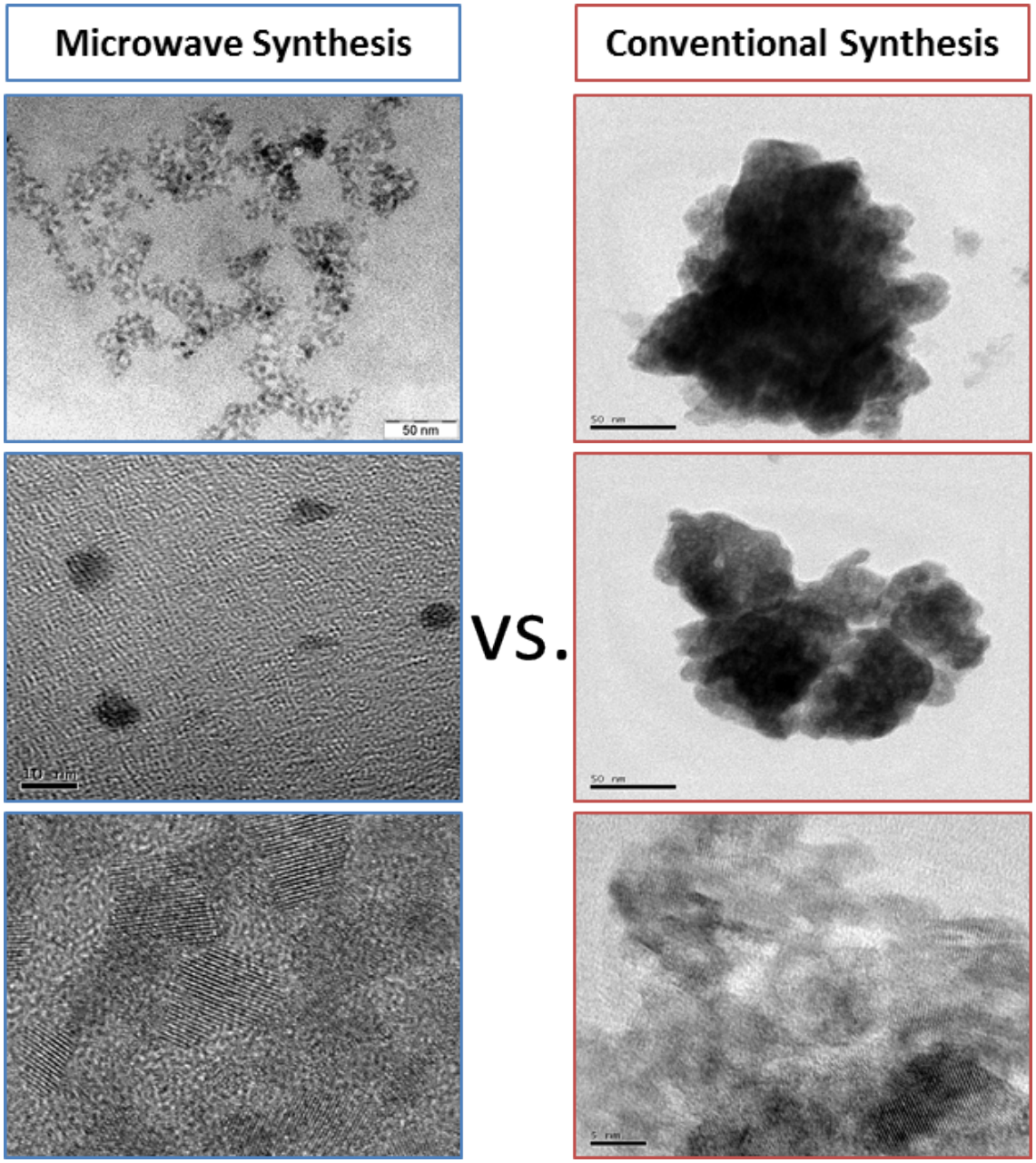
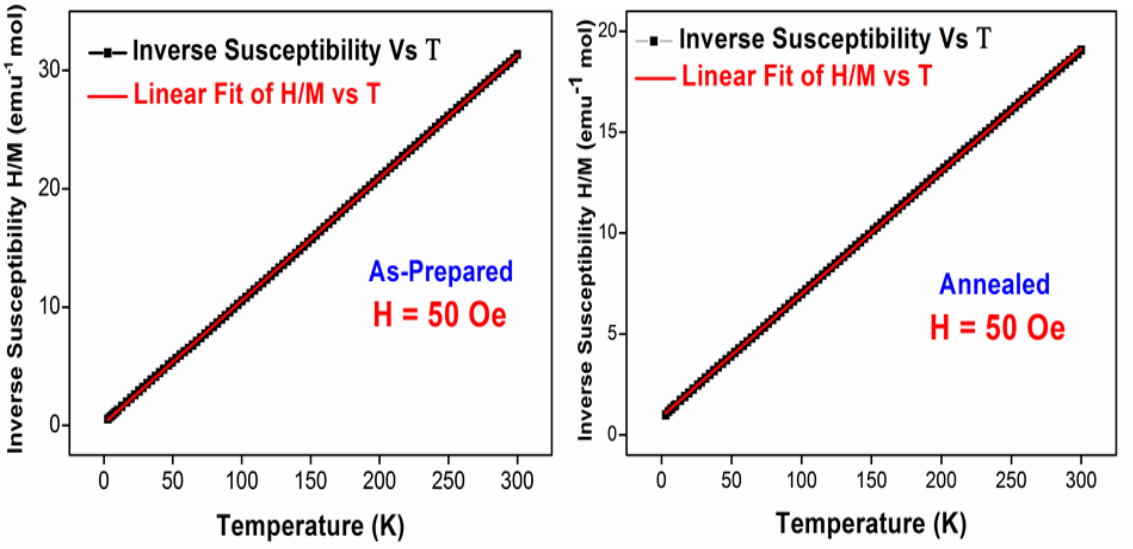


Fig. S2 Nanoparticles of Gd_2O_3 prepared by microwave-assisted and conventional heating routes. A lot of aggregation is observed in the conventionally heated sample, in contrast with the sample prepared by the microwave irradiation route, which leads to nanoparticles that are less agglomerated, better crystallised, and show low dispersity in size.



Equation	y = a + b*x		
Weight	No Weighting		
Residual Sum of Squares	0.28154		
Pearson's r	0.99998		
Adj. R-Square	0.99997		
		Value	Standard Erro
H/M	Intercept	0.1826	0.01038
	Slope	0.1036	5.97931E-5

Equation	y = a + b*x		
Weight	No Weighting		
Residual Sum of Squares	0.09883		
Pearson's r	0.99998		
Adj. R-Square	0.99997		
		Value	Standard Erro
H/M	Intercept	0.9059	0.00615
	Slope	0.0607	3.54374E-5

Fig. S3 Inverse magnetic susceptibility (H/M) vs. temperature in a magnetic field of 50 Oe, over the temperature range 3 K and 300 K, for as-prepared and annealed Gd_2O_3 nanocrystals (black line). The experimental data are fitted (red line) to the Curie-Weiss equation to obtain the Weiss constant (θ) and the Curie constant (C). The fitted results are also listed in two tables: one for the as-prepared Gd_2O_3 nanocrystals and the other for the annealed sample.

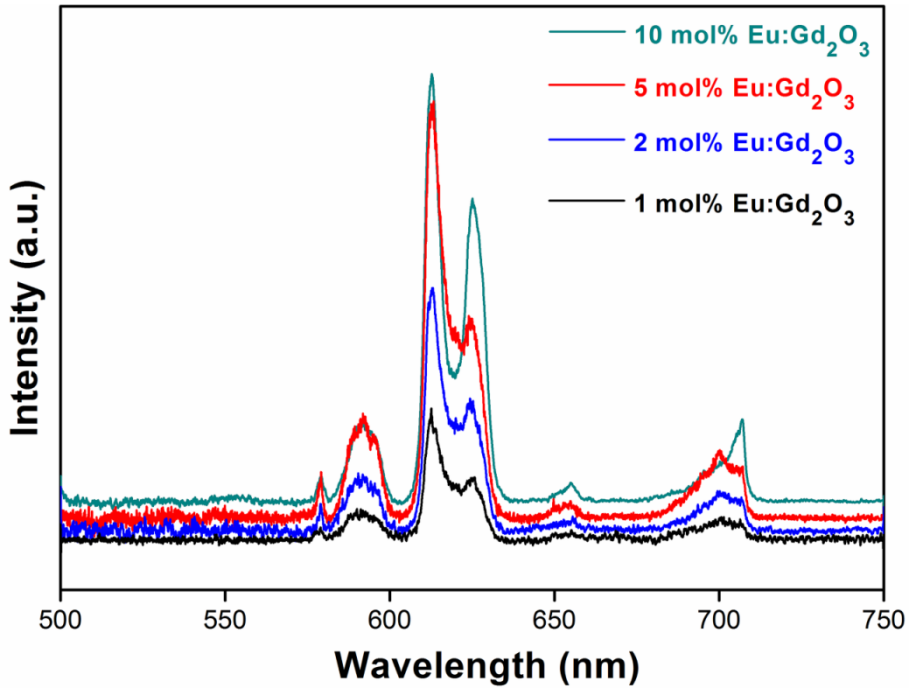


Fig. S4 Variation in PL emission intensity with Eu doping concentration. No appreciable increase in emission intensity is observed after 5 mol% Eu doping concentration. This may be attributed both to concentration quenching and to defect quenching, because a greater proportion of Eu ions lie on the surface of the nanocrystals.

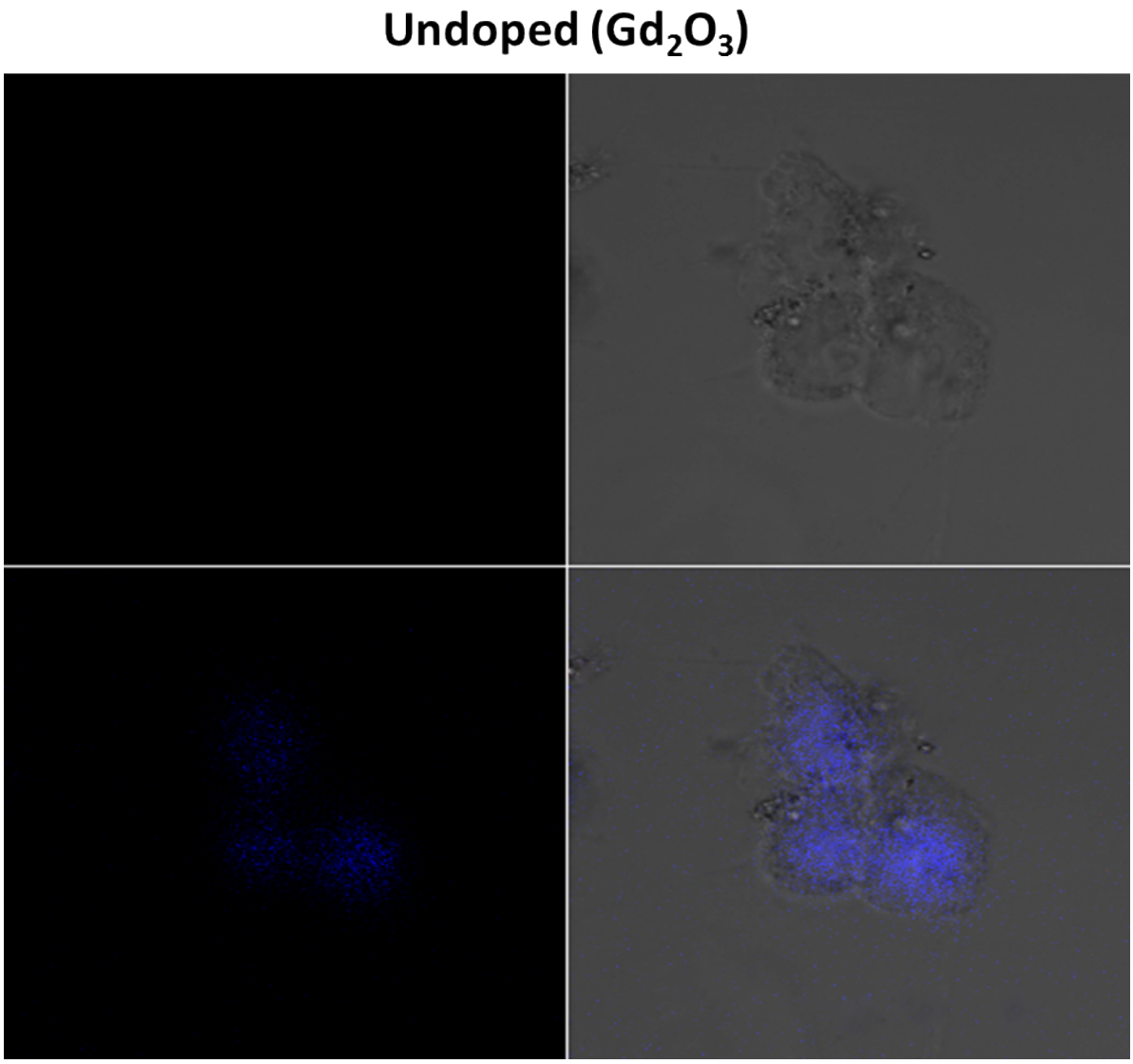


Fig. S5 HEK293 cells treated with undoped Gd_2O_3 nanoparticles. As expected, no fluorescence is observed, because Gd^{3+} is inactive in visible region.

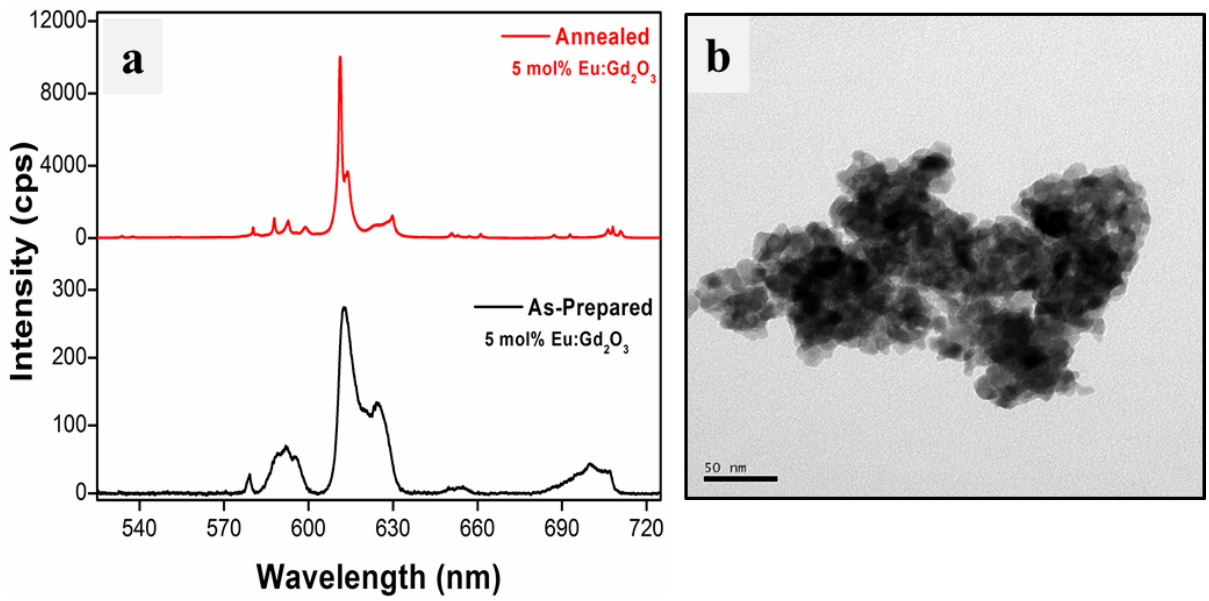


Fig. S6 (a) Comparison of PL emission intensities of as-prepared and annealed Eu:Gd_2O_3 (5 mol%) nanocrystals (excitation wavelength 325 nm). The annealed powders show more intense emission with sharper peaks than does the as-prepared powder. (b) TEM image of Eu:Gd_2O_3 annealed at 600 °C for 2 hours showing the agglomerated nanoparticles.