

Supporting information for

Diffusive Flux of Nanoparticles Through Porous Membranes with Chemically Modified Surfaces

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Figure S1. (A, B, C) Transmission electron microscopy images of the CoFe_2O_4 nanoparticles used in these studies. Scale bar is 50 nm (D) absorbance spectra of the three nanoparticle samples in hexane.

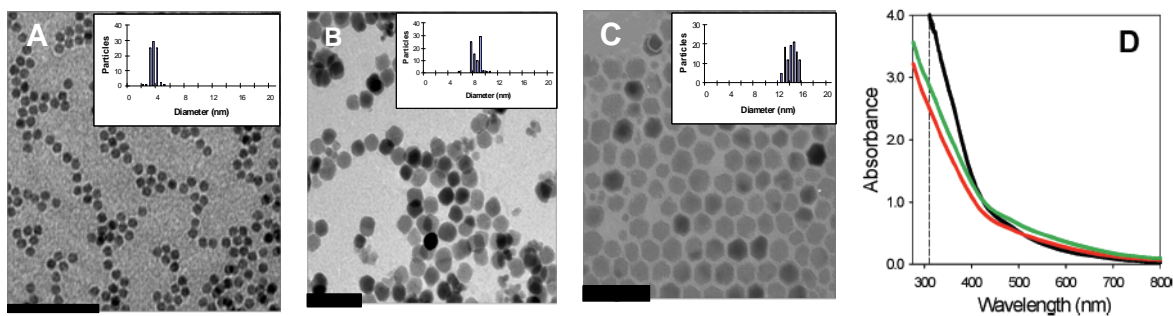


Figure S2 FTIR spectra of the silane-modified alumina membranes. **(A)** C₆ chain, **(B)** C₁₂ chain, **(C)** C₁₈ chain, **(D)**, NH₂ terminated **(E)** Br terminated, and **(F)** COOH terminated.

In spectra A – C, a strong C-H stretch is observed (C₆: 2896 and 2769 cm⁻¹; C₁₂: 2924 and 2854 cm⁻¹; C₁₈: 2927 and 2859 cm⁻¹). In spectrum D a stretch is observed at 3109 cm⁻¹ indicative of N-H, and a band at 1192 cm⁻¹ corresponds to C-N. In spectrum E, the bromine gives rise to a strong stretch at 843 cm⁻¹. Spectrum F contains C-H stretches and at 1692 cm⁻¹ a strong, defined stretch at 1692 cm⁻¹. Also at 1299, a medium stretch is observed for C-O at 1299 cm⁻¹.

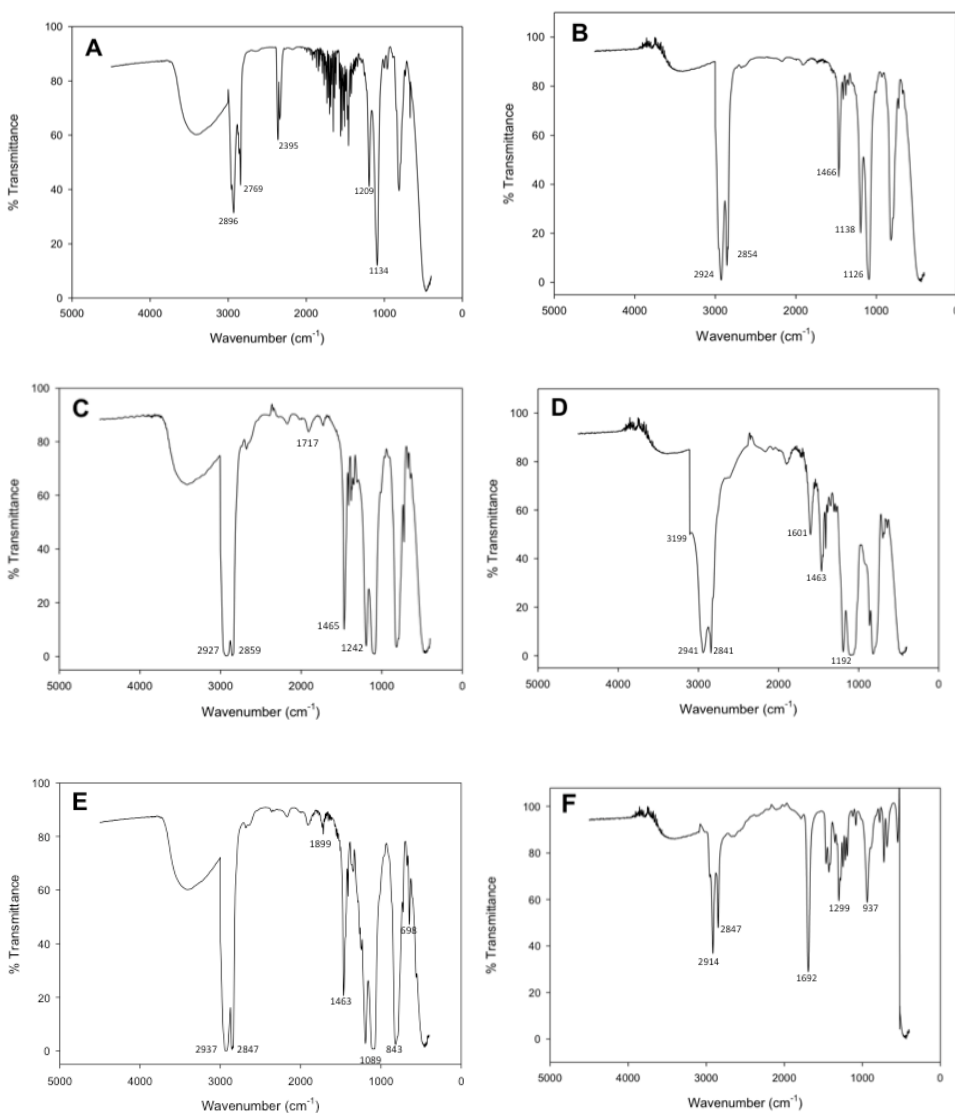


Figure S3. Schematic of the u-tube cell geometry.

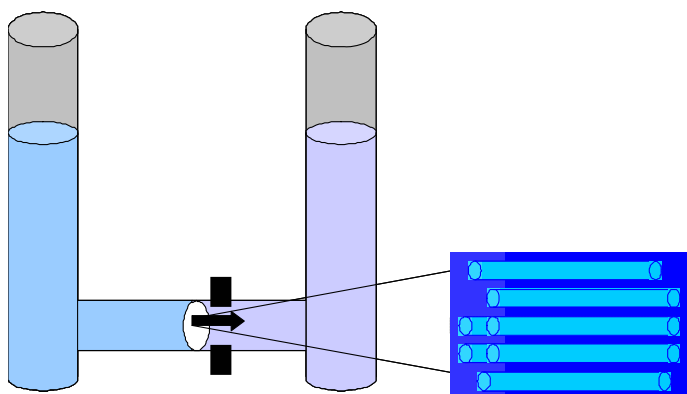


Figure S4. Plot of the flux of CoF_2O_4 nanoparticles in hexane solutions across alumina membranes with 200 nm diameter pores and modified with the indicated alkyl silanes.

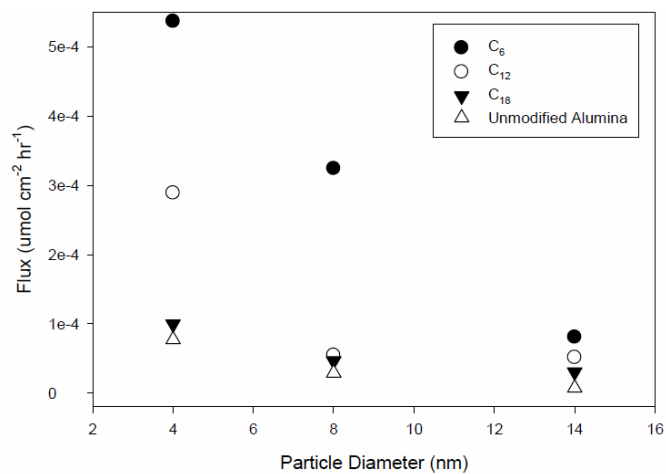


Table S1. Flux of nanoparticles through alumina membranes with 200 nm pore diameters

CoFe ₂ O ₄ Nanoparticle Diameter (nm)	K _p D Water (cm ² /sec) x 10 ⁻⁹		K _p D Hexane (cm ² /sec) x 10 ⁻⁹	
	Unmodified Alumina	C ₁₂ Silane Modified Alumina	Unmodified Alumina	C ₁₂ Silane Modified Alumina
4	11	44	90	360
8.5	24	225	70	120
14	21	84	27	107

Table S2. Flux through alumina membranes with 100 nm pore diameters in hexane solutions with indicated alkyl silane monolayers

CoFe ₂ O ₄ Nanoparticle Diameter (nm)	K _p D Hexane (cm ² /sec) x 10 ⁻⁹			
	C ₁₂	Br	NH ₂	COOH
4 nm	5.9	20	2.8	1.3
8.5 nm	21	28	1.5	1.6
14 nm	8.0	37	4.9	0.5

Table S3. K_pD values for CoFe_2O_4 nanoparticles diffusing across alumina membranes with 200 nm diameter pores in water or hexane solutions with indicated silane monolayers.

CoFe₂O₄ Nanoparticle Diameter (nm)	K_pD in Water (cm²/sec) x 10⁻⁶		
	C₁₂	Br	NH₂
4	1.9	0.96	0.90
8.5	1.9	1.64	0.81
14	1.6	0.93	0.31
K_pD in (cm²/sec) Hexane x 10⁻⁶			
	C₁₂	Br	NH₂
4	27	16	3.7
8.5	6.52	5.6	3.3
14	2.2	2.0	1.4