Electronic Supplementary Information (ESI)

Influence of serum concentration and surface functionalization on the protein adsorption to mesoporous silica nanoparticles

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Table S1. Derived nitrogen sorption results of COOH-MSNs.

MSNs	TG loss (%)	D_{DFT} (nm)	S_{BET} (m^2g^{-1})	S_{ext} (m^2g^{-1})	V_t (cm^3g^{-1}) *@P/P_0 ~0.8*
COOH-MCM-41	7.6	3.2	823	174	0.49
COOH-MCM-48	8.5	2.9	976	159	0.54
COOH-R-MCM-48	5.9	3.5	863	443	0.63

Table S2. TG loss (%) of the studied particles in the range of 200-600 ºC.

			All-silica MSNs		COOH-MSNs		ATTO-MSNs	
MSN	Time (h)	FCS (%)	Total TG loss (%)	Protein loss (%)	Total TG loss (%)	Protein loss (%)	Total TG loss (%)	Protein loss (%)
MCM-41	-	-	-	-	7.6	-	6.4	-
	0.5	10	15.4		18.5	10.9	16.7	10.3
	5	10	17.0		24.7	17.1	19.0	12.6
	0.5	100	26.7		26.9	19.3	25.0	18.6
	5	100	29.2		29.9	22.3	32.0	25.6
MCM-48	-	-	-	-	8.5	-	6.4	-
	0.5	10	14.7		17.8	9.3	17.4	11.0
	5	10	18.5		16.7	8.2	19.8	13.4
	0.5	100	27.6		26.6	18.1	27.1	20.7
	5	100	30.7		31.3	22.8	32.1	25.7
R-MCM-48	-	-	-	-	5.9	-	5.4	-
	0.5	10	16.5		18.8	12.9	19.6	14.2
	5	10	20.9		23.6	17.7	24.2	18.8
	0.5	100	28.9		27.1	21.2	29.0	23.6
	5	100	33.8		35.8	29.9	36.2	30.8

Table S3. Intensity change (%) of functionalized particles as compared to all-silica particles.

Time	0.5 h		5 h	
FCS	10%	100%	10%	100%
COOH-MCM-41	-34.8	-19.7	-16.0	-28.9
COOH-MCM-48	-31.3	-13.2	-30.2	-20.2
COOH-R-MCM-48	-9.2	-6.2	-21.7	-8.4
ATTO-MCM-41	-27.5	-15.9	-2.7	-26.3
ATTO-MCM-48	-38.8	-28.1	-23.3	-22.9
ATTO-R-MCM-48	-35.4	-14.6	-37.0	-6.0

Table S4. Literature results on protein adsorption on silica NPs.

Literature	Particle	Particle conc.	Protein solution	Incubation Temp.	Incubation time.	Results
Clemments et al. *RSC Adv*. **2014**, *4*, 29134-29138.	70 nm MSNs	1.0 mg mL^{-1}	10%FBS/ DMEM	RT	1 h	1. Protein amount MSN-NH_2> MSN-OH> MSN-COOH. 2. High ApoA1 and ApoA2, low BSA.
Clemments et al. *ACS Appl. Mater. Interfaces* **2015**, *7*, 21682-21689.	70 and 85 nm MSNs	1.0 mg mL^{-1}	10%FBS/ DMEM	RT	1 h	1. Pore exclusion. 2. More protein adsorption on higher surface area. 3. Smooth surface favors protein adsorption.
Saikia et al. *ACS Appl. Mater. Interfaces* **2016**, *8,* 34820-34832.	500 nm MSNs 50 and 500 nm stober silica	1.0 mg mL^{-1}	10%FBS/ DMEM	N.A.	1 h	1. Smooth surface favors protein adsorption.
Pisani et al. *Nanoscale* **2017**, *9,* 1840-1851.	100 nm manetic MSNs	<1.0 mg mL^{-1}	Unclear % of human plasma and FCS	RT	0.5 min – 7 day	1. BSA gets lower and apolipoproteins get higher over time.
Monopoli et al. *J. Am. Chem. Soc*. **2011**, *133*, 2525-2534.	200 nm SiO_2 NPs	1.25 mg mL^{-1}	3-80% human plasma	On ice	1 h	1. High ApoA1 and low BSA. 2. ApoA1 and BSA increase with plasma concentration.
Ghavami et al. *RSC Adv.* **2013**, *3*, 1119-1126.	100 nm SiO_2 NPs	0.1 mg mL^{-1}	10-80% (Non)gradient human plasma	37 ^oC	1 h	1. Low MW proteins (< 25 kDa) increase more with plasma concentration.

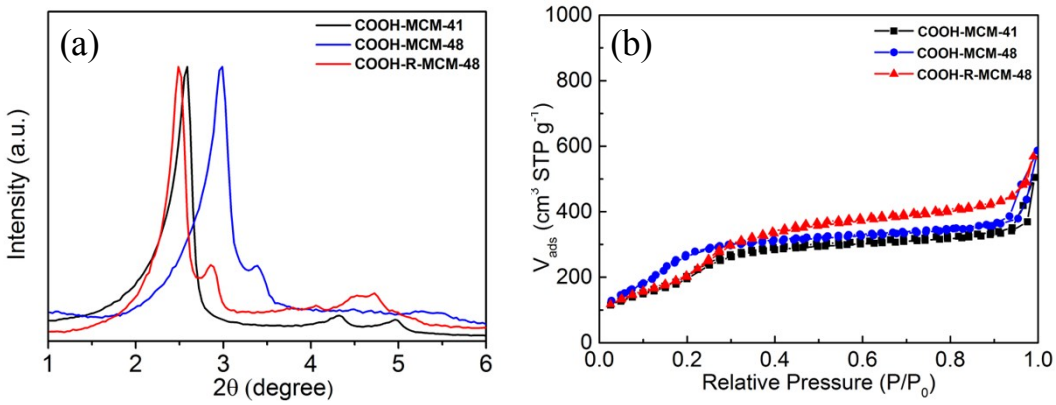

Figure S1. (a) XRD patterns and (b) nitrogen sorption isotherms of COOH-MSNs

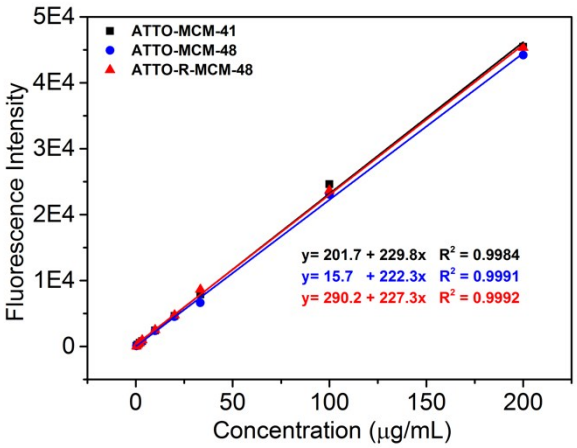

Figure S2. Calibration curves of fluorescence intensity versus concentration of ATTO-MSNs.

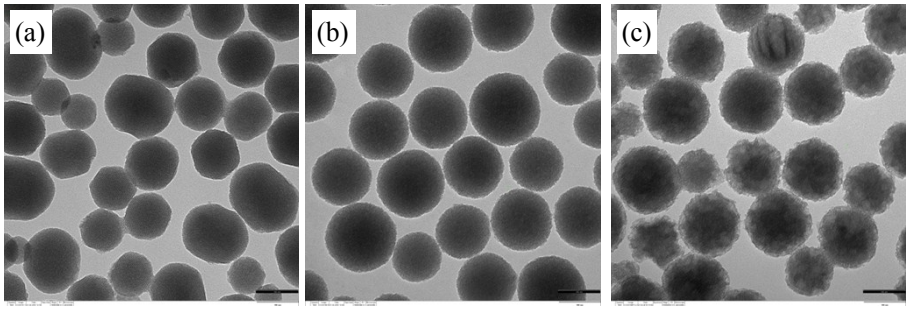

Figure S3. TEM images of (a) COOH-MCM-41, (b) COOH-MCM-48, and (c) COOH-R-MCM-48. The scale bar indicates 100 nm.

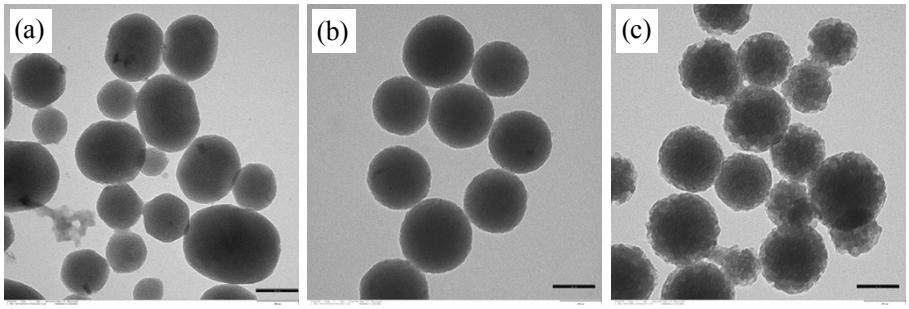

Figure S4. TEM images of (a) ATTO-MCM-41, (b) ATTO-MCM-48, and (c) ATTO-R-MCM-48. The scale bar indicates 100 nm.