

SUPPLEMENTARY INFORMATION

**Gold-supported magnetically recyclable nanocatalysts:
a sustainable solution for the reduction of 4-nitrophenol in water**

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Figure S1. FTIR spectra of Mn, Mn@SiO₂, Mn@SiO₂-NH₂ and Mn@SiO₂-SH samples.

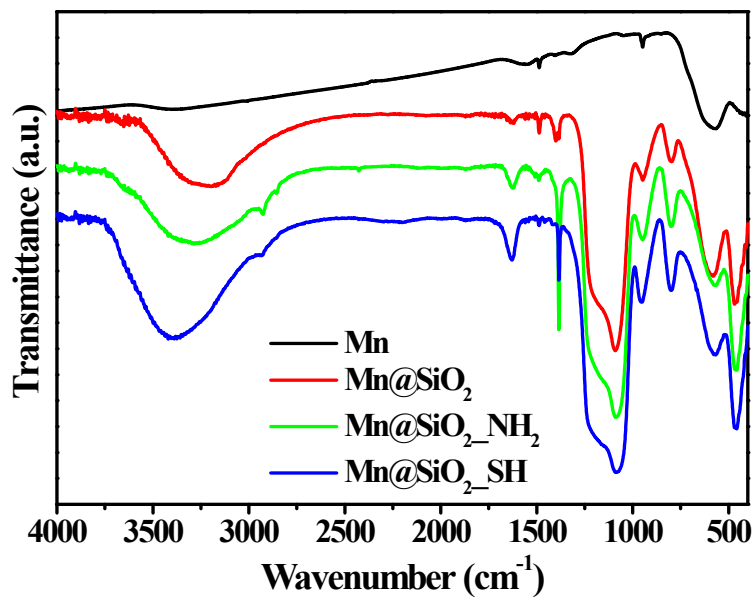


Figure S2. TEM micrographs of (a.1) Mn@SiO₂_SH and (a.2) Mn@SiO₂_SH@Au and EDS spectra of (b.1) Mn@SiO₂_SH and (b.2) Mn@SiO₂_SH@Au.

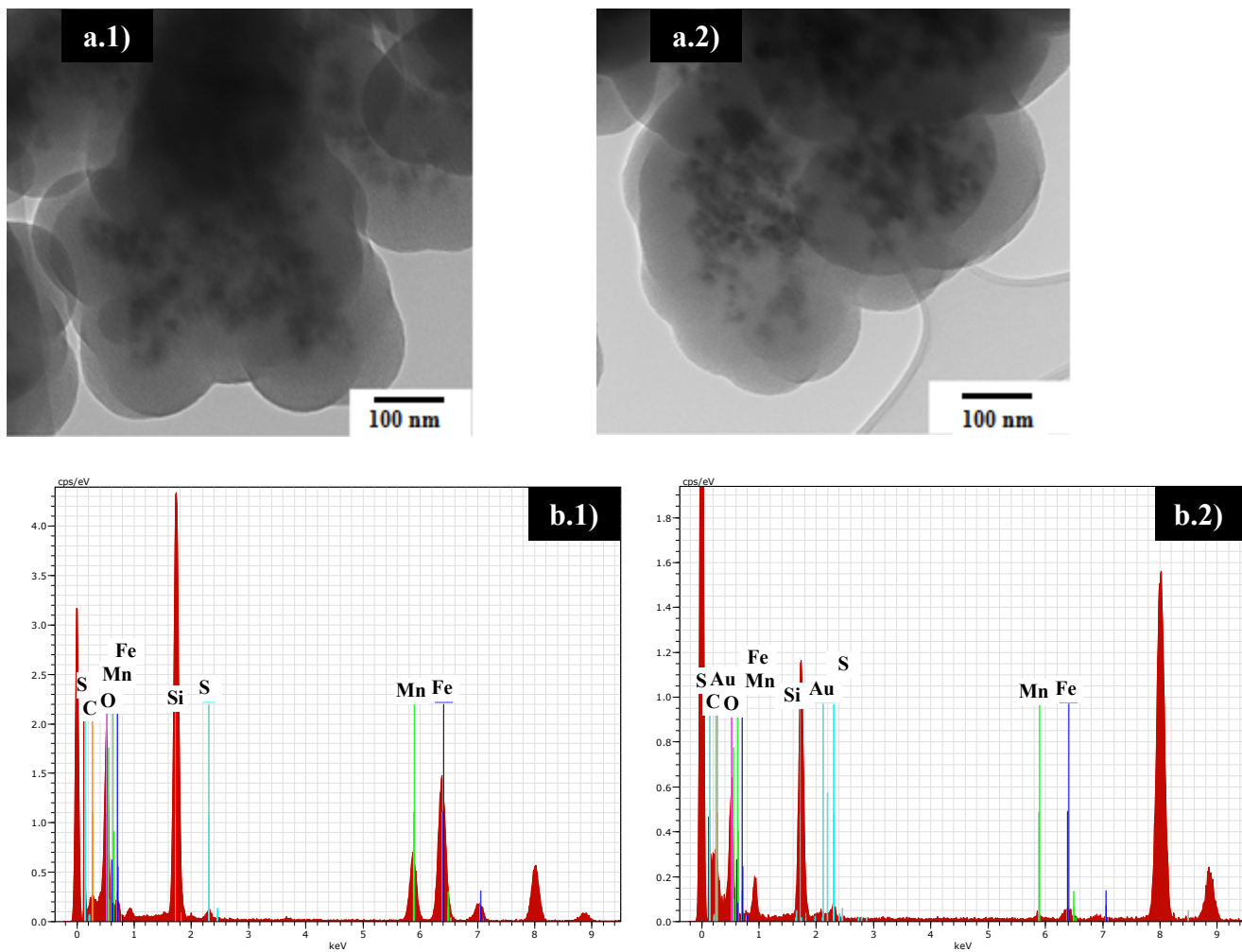


Figure S3. $M(H)$ curves of samples Mn, Mn@SiO₂, Mn@SiO₂-NH₂, Mn@SiO₂-SH at 300 K.

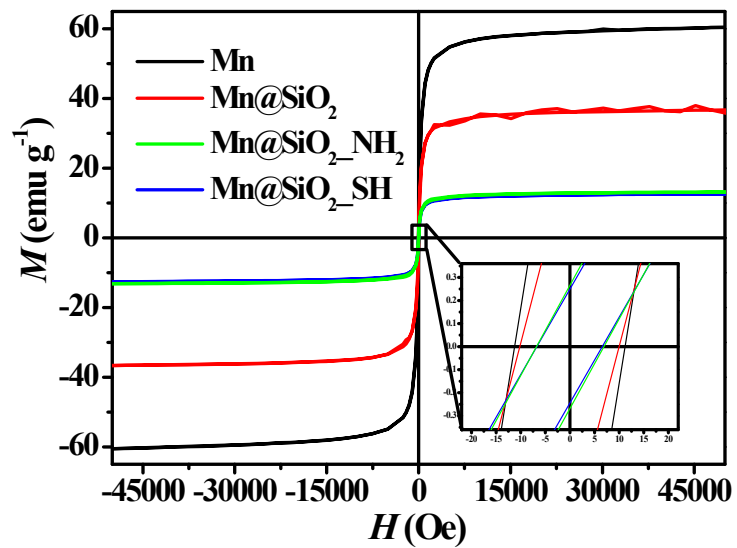


Figure S4. Electronic spectra of 4-NP reduction with Mn@SiO₂-NH₂ nanosupport.

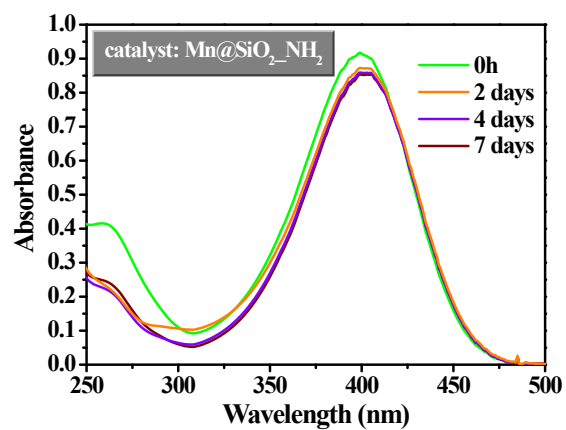


Figure S5. FTIR spectra of magnetic nanocatalysts before and after the catalytic recycling studies.

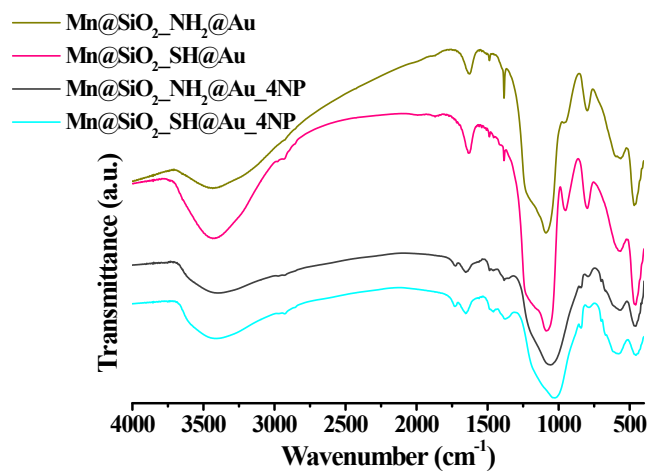


Table S1. Core-level binding energies and area of each component for magnetic nanomaterials obtained by curve fitting of XPS spectra

Material	C 1s		O 1s		N 1s		Si 2p		Mn 2p _{3/2}		Mn 2p _{1/2}	
	BE (eV) ^a	Area (%) ^b	BE (eV) ^a	Area (%) ^b	BE (eV) ^a	Area (%) ^b	BE (eV) ^a	Area (%) ^b	BE (eV) ^a	Area (%) ^b	BE (eV) ^a	Area (%) ^b
Mn@SiO ₂ _NH ₂	284.6 (3.1)	84.1	531.7 (2.2)	82.7	399.4 (2.5)	59.8	102.6 (1.9)	100.0	641.0 (5.0)	87.6	652.6 (4.9)	43.8
	286.5 (3.1)	9.7	529.8 (2.2)	17.3	401.2 (2.5)	40.2			646.4 (5.1) ^c	12.4	658.0 (5.1) ^c	6.2
	288.5 (3.1)	6.2										
Mn@SiO ₂ _NH ₂ @Au	284.6 (2.2)	69.5	532.4 (2.1)	95.5	399.6 (2.3)	52.8	103.1 (2.2)	100.0	641.1 (4.4)	73.3	652.7 (4.4)	36.7
	286.4 (2.2)	24.8	530.4 (2.1)	4.5	401.6 (2.3)	47.2			646.5 (4.1) ^c	26.7	658.1 (4.1) ^c	13.3
	288.5 (2.2)	5.7										
Mn@SiO ₂ _SH	284.6 (2.1)	74.7	532.5 (2.1)	94.6	400.3 (2.4)	75.5	103.2 (2.2)	100.0	642.6 (4.2)	80.3	654.2 (4.2)	40.2
	286.3 (2.1)	19.0	531.0 (2.1)	5.4	402.5 (2.4)	24.5			648.0 (3.8) ^c	19.7	659.6 (3.8) ^c	9.8
	288.4 (2.1)	6.2										
Mn@SiO ₂ _SH@Au	284.6 (2.5)	82.5	532.7 (2.0)	73.0	399.5 (2.6)	62.0	102.9 (2.3)	100.0	642.4 (4.4)	85.9	654.0 (4.4)	43.0
	286.5 (2.5)	14.0	531.5 (2.0)	27.0	402.2 (2.6)	38.0			647.8 (2.9) ^c	14.1	659.4 (2.9) ^c	7.0
	288.6 (2.5)	3.5										
	Fe 2p _{3/2}		Fe 2p _{1/2}		S 2p _{3/2}		S 2p _{1/2}		Au 4f _{7/2}		Au 4f _{5/2}	
	BE (eV) ^a	Area (%) ^b	BE (eV) ^a	Area (%) ^b	BE (eV) ^a	Area (%) ^b	BE (eV) ^a	Area (%) ^b	BE (eV) ^a	Area (%) ^b	BE (eV) ^a	Area (%) ^b
Mn@SiO ₂ _NH ₂	710.3 (3.2)	69.9	723.8 (3.2)	35.0	—	—	—	—	—	—	—	—
	718.3 (7.2) ^c	30.1	731.8 (7.2) ^c	15.0								
Mn@SiO ₂ _NH ₂ @Au	710.5 (3.3)	64.5	724.0 (3.3)	32.3	—	—	—	—	84.2 (2.0)	57.1	87.9 (2.0)	42.9
	718.5 (6.3) ^c	35.5	732.0 (6.3) ^c	17.7								
Mn@SiO ₂ _SH	710.7 (3.5)	72.8	724.2 (3.5)	36.4	163.3 (2.0)	44.3	164.5 (2.0)	22.2	—	—	—	—
	718.7 (7.2) ^c	27.2	732.2 (7.2) ^c	13.6	168.3 (2.0)	22.3	169.5 (2.0)	11.2				

Mn@SiO₂_SH@Au	710.3 (3.2)	69.9	723.8 (3.2)	35.0	162.7 (2.3)	38.2	163.9 (2.3)	19.1	84.5 (2.3)	57.1	88.2 (2.3)	42.9
	718.3 (7.2) ^c	30.1	731.8 (7.2) ^c	15.0	167.8 (2.3)	28.4	169.0 (2.3)	14.2				

^a The values between brackets refer to the full-width at half maximum of the bands.

^b Area of each component relative to the total core-level peak area.

^c Satellite peak.