Supporting Information

Mesoporous Cr_2O_3-Phosphomolybdic Acid Solid Solution Frameworks with High Catalytic Activity

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Table S1. Analytical data of mesoporous CrPMA(*w*) composite materials.

Sample	Atomic ratio† (Cr:P:Mo)	PMA loading‡ (wt %)
CrPMA(18)	112.3:0.9:12	17.6 (19)
CrPMA(30)	57.3:0.9:12	29.5 (32)
CrPMA(39)	36.9:0.9:12	39.4 (40)
CrPMA(52)	21.1:1.2:12	52.4 (54)
CrPMA(63)	14.0:1.1:12	63.2 (63)

†EDS elemental data normalized to the twelve-atom Mo_{12} unit. ‡In parenthesis: the theoretical wt % of PMA content according to the nominal composition.

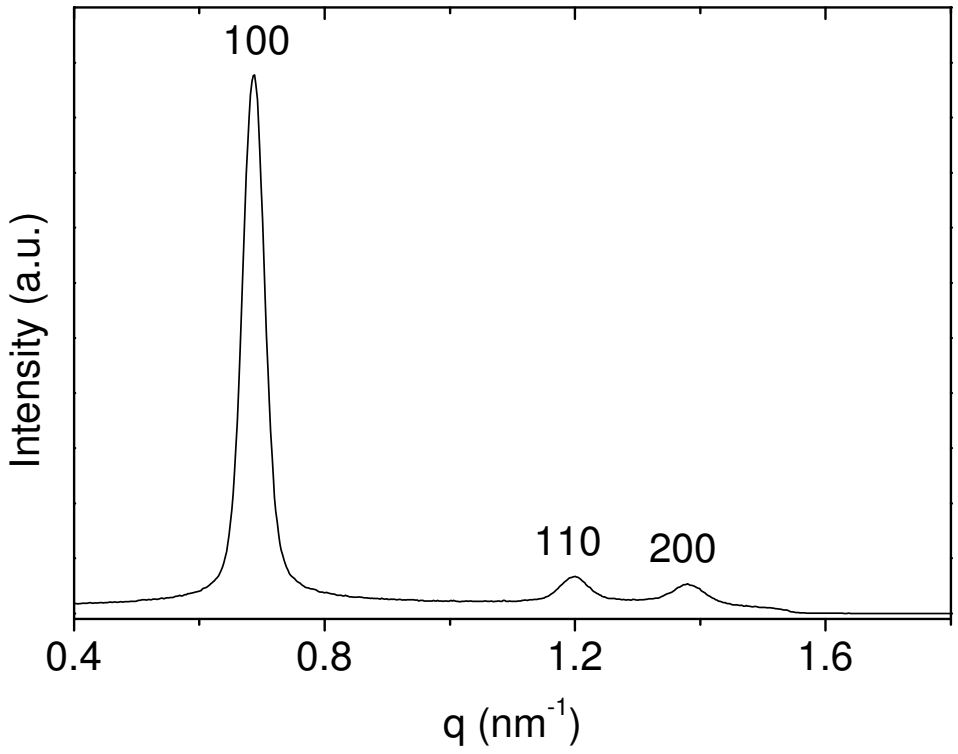

Figure S1. SAXS pattern of mesoporous SBA-15. The indexing of the Bragg diffractions is consisted with a hexagonal *p6mm* unit cell with lattice parameter a_o=10.6 nm.

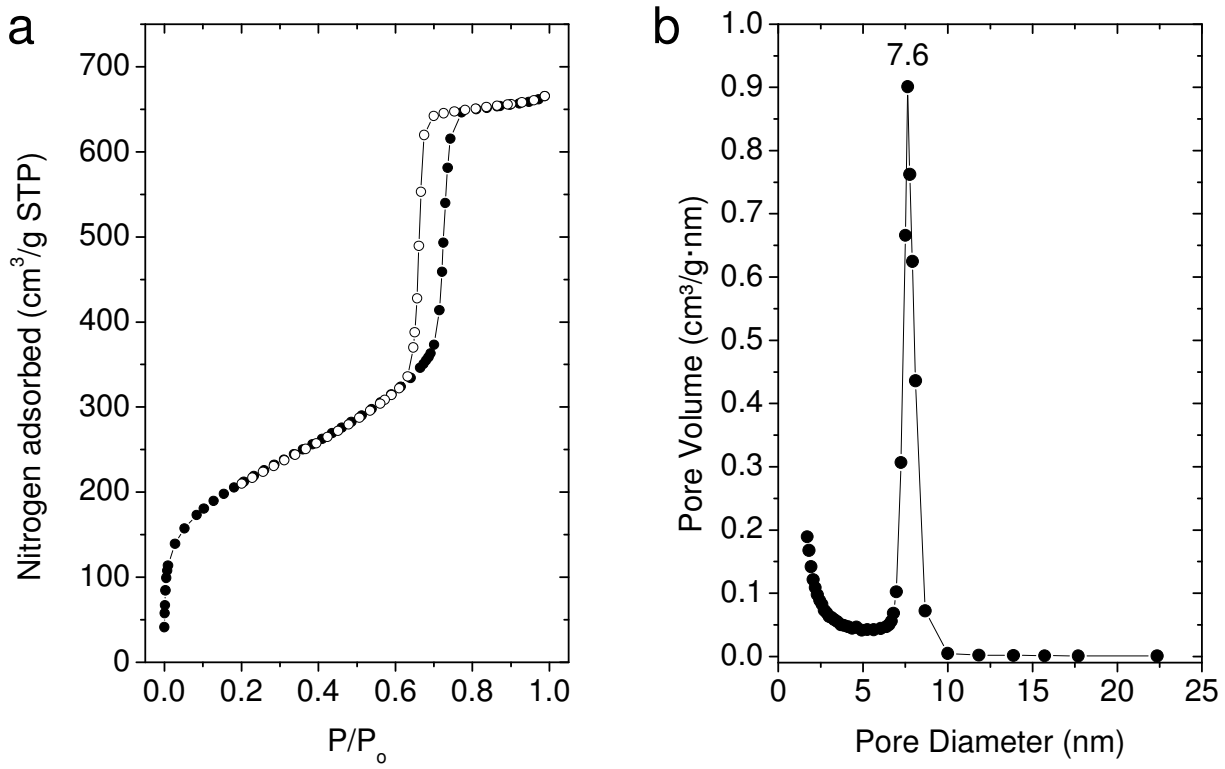

Figure S2. (a) Nitrogen adsorption-desorption isotherms at 77K of mesoporous SBA-15 silica (solid circles: adsorption data, open circles: desorption data). Analysis of the adsorption branch with the BET method gives surface area of 767 m^2g^{-1} and total pore volume of 1.02 cm^3g^{-1}. (b) NLDFT pore size distribution calculated from the adsorption branch. The mesopore diameter (D_p=7.6 nm) together with the unit cell size (a_o=10.6 nm) determined by SAXS analysis, indicates a framework wall thickness of *ca.* 3 nm, according to the equation $WT=a_o-D_p$.

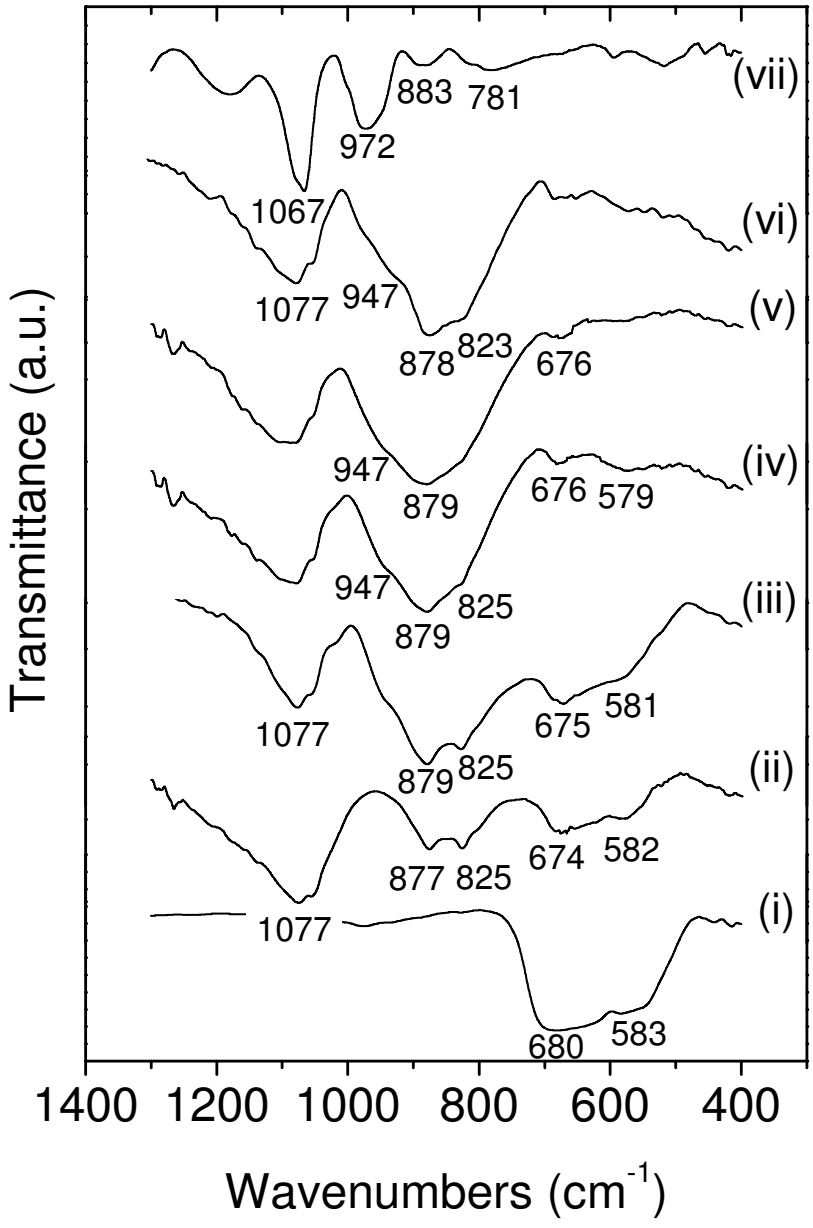

Figure S3. FT-IR spectra of mesoporous (i) *meso*-Cr_2O_3, (ii) CrPMA(18), (iii) CrPMA(30), (iv) CrPMA(39), (v) CrPMA(52) and (vi) CrPMA(63) materials and (vii) bulk 12-phosphomolybdic acid ($H_3PMo_{12}O_{40}$). The strong absorption peaks at ~674-676 and ~579-583 cm^{-1} are assigned to stretching vibrations of Cr-O bonds in Cr_2O_3 oxide.[1,2]

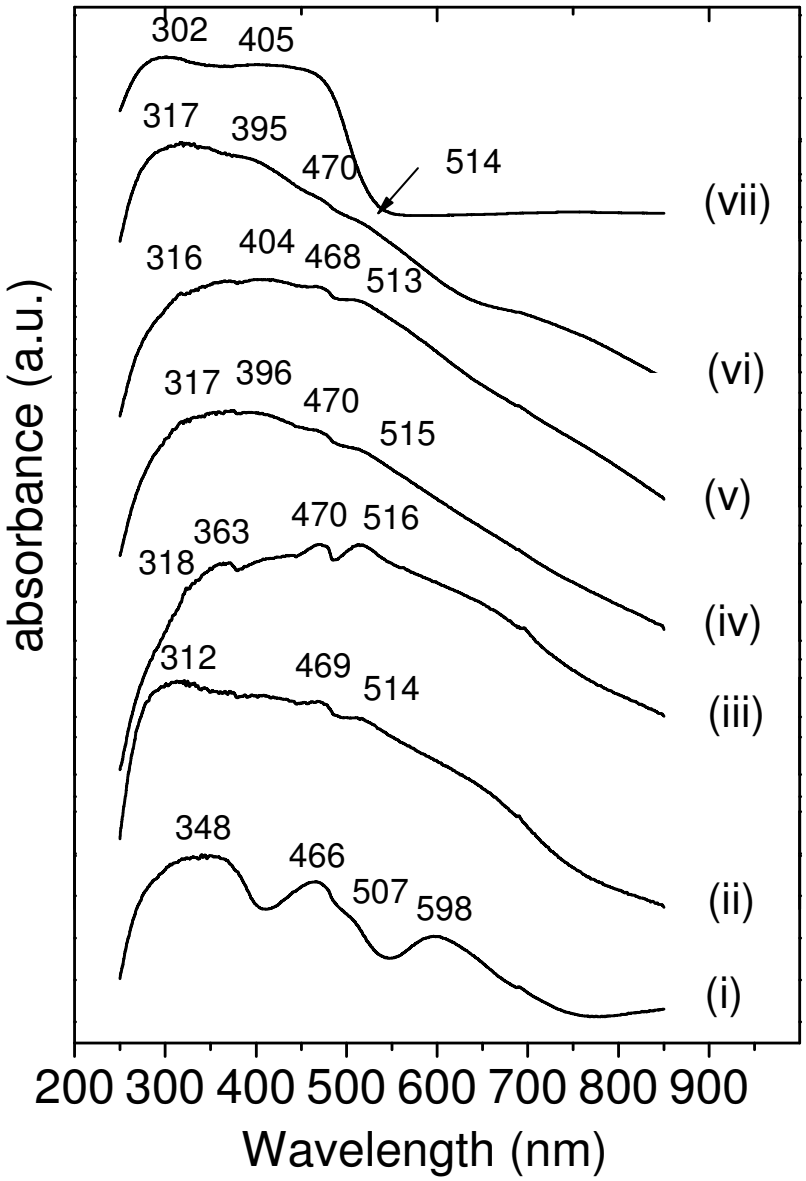

Figure S4. Diffuse reflectance UV/vis spectra of mesoporous (i) *meso*-Cr_2O_3, (ii) CrPMA(18), (iii) CrPMA(30), (iv) CrPMA(39), (v) CrPMA(52) and (vi) CrPMA(63) materials and (vii) bulk 12-phosphomolybdic acid.

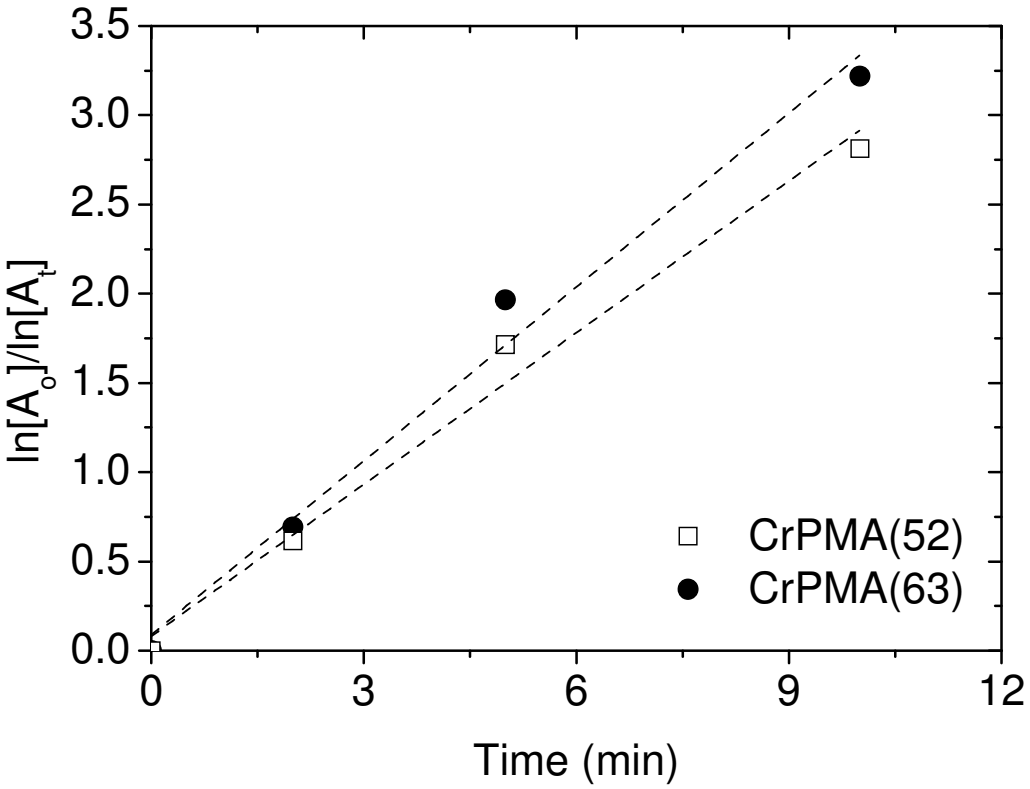

Figure S5. Kinetic profiles of mesoporous CrPMA(52) and CrPMA(63) catalysts ([A_o], [A_t] are the initial and final (after time t) molar concentrations of 1-phenylethanol, respectively). The corresponding dashed lines are fit to the data (R_{sq}= 0.9789 for CrPMA(52); R_{sq}= 0.9883 for CrPMA(63)).

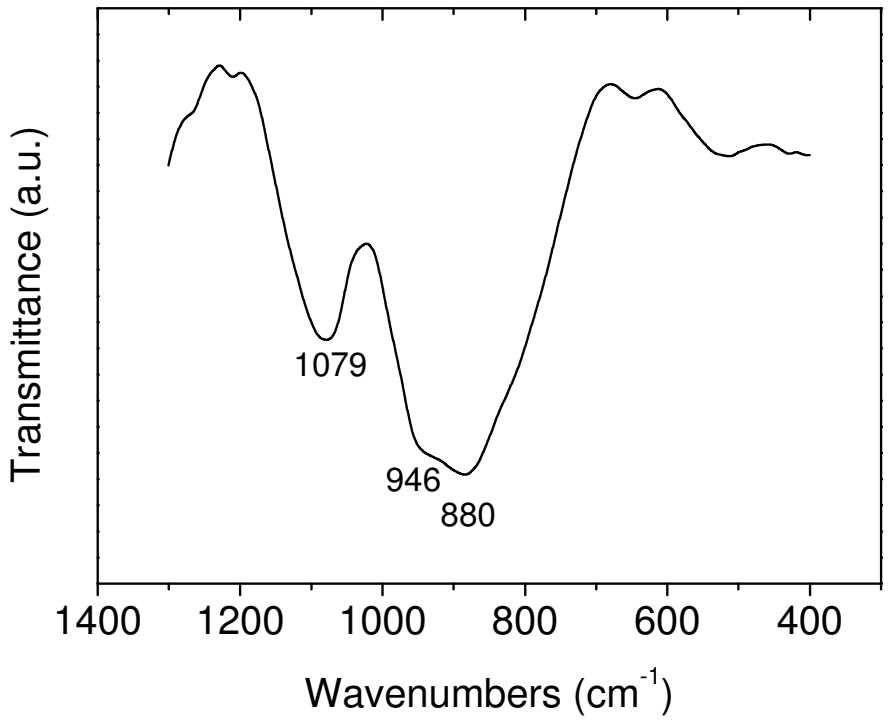

Figure S6. FT-IR spectrum of four-times reused CrPMA(52) catalyst, showing intense absorption peaks at ~946 and ~880 cm^{-1} that are attributed to the stretching vibration bands of $Mo{=}O_d$ and $Mo\text{-}O_b\text{-}Mo$ bonds. The intense peak at ~1079 cm^{-1} is assigned to the O–P–O stretching vibrations of distorted $[PMo_{12}O_{40}]^{3-}$ Keggin clusters.

References

(1) McDevitt, N. T.; Braun, W. L. *Spectrochim. Acta* **1964**, *20*, 799.

(2) An, G.; Zhang, Y.; Liu, Z.; Miao, Z.; Han, B.; Miao, S.; Li, J. *Nanotechnology* **2008**, *19*, 035504/1-035504/7