

Electronic Supplementary Information (ESI)

One-pot synthesis of molybdenum oxide nanoparticles encapsulated in hollow silica spheres: an efficient and reusable catalyst for epoxidation of olefins

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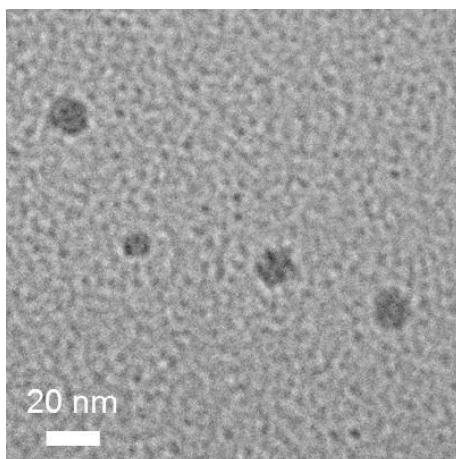


Fig. S1 TEM image of MoO_x NPs-PAA (poly(acrylic acid)) aggregates.

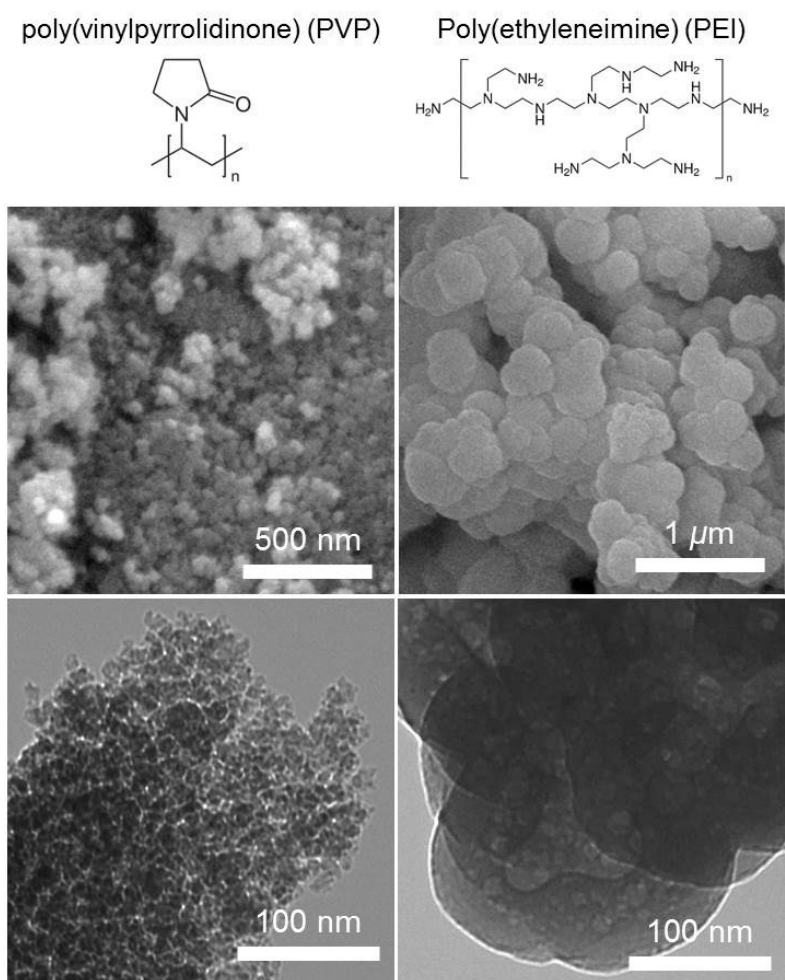


Fig. S2 (above) FE-SEM and (below) TEM images of MoO_x-SiO₂ composites prepared by using poly(vinylpyrrolidinone) (PVP, K-30; $M_w = 30,000$) and poly(ethyleneimine) (PEI; $M_w = 1,800$) as organic templates instead of PAA (poly(acrylic acid)).

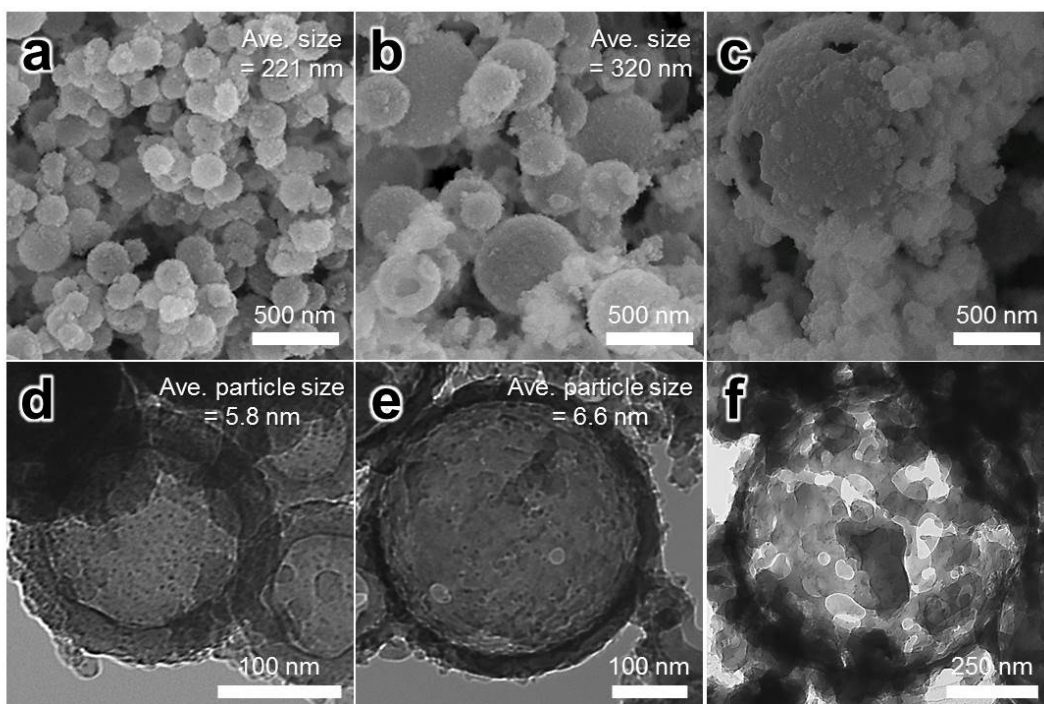


Fig. S3 (above) FE-SEM and (below) TEM images of $\text{MoO}_x\text{@HSS-2}$ catalysts synthesized with varied amounts of Mo contents ((a, d) 7 (b, e) 14 and (c, f) 28 wt% as MoO_3 in initial synthetic solutions).

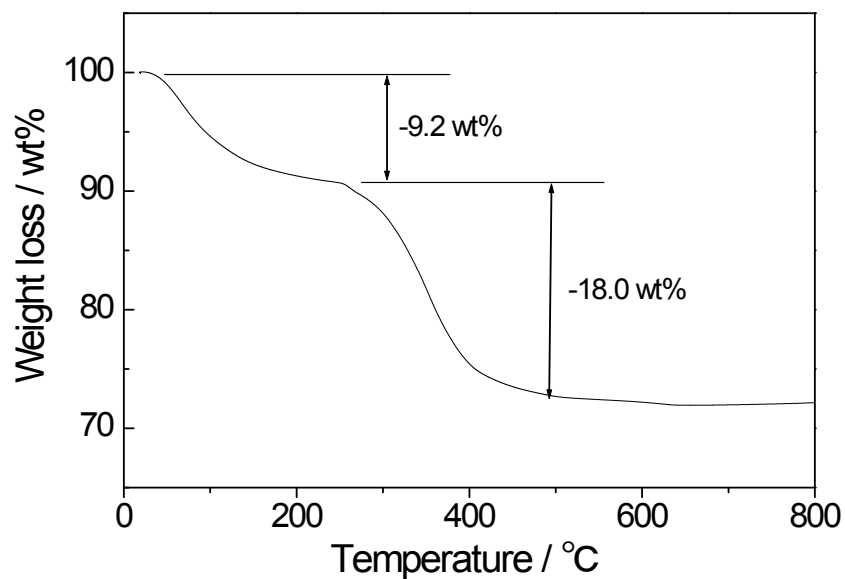


Fig. S4 Weight loss curve of as-synthesized $\text{MoO}_x\text{@HSS-2}$ catalyst. The weight loss seen below 250 °C is ascribed to the desorption of physisorbed molecules and the weight loss seen above 250 °C is ascribed to the elimination of PAA (poly(acrylic acid)) and alkyl groups of dodecyltrimethoxysilane (C_{12}TMS).

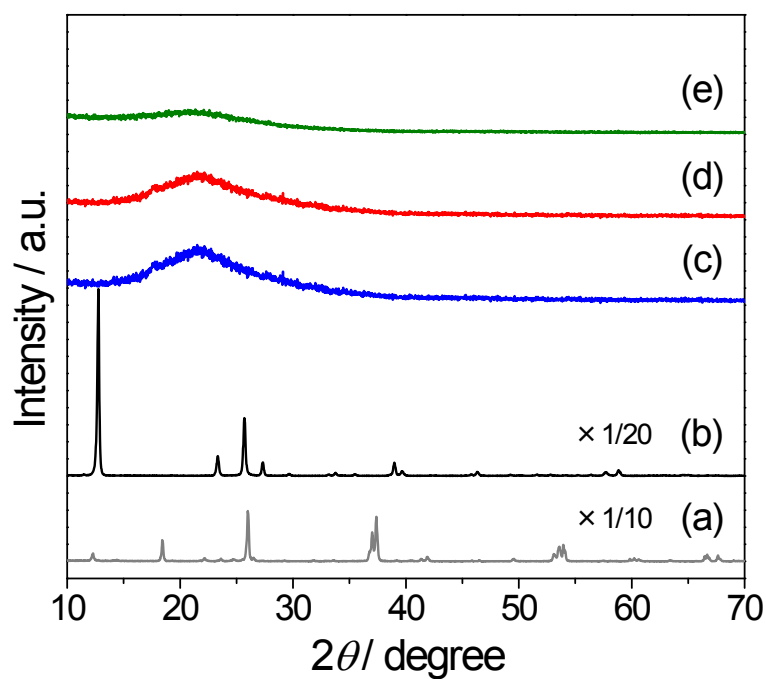


Fig. S5 XRD patterns of (a) MoO_2 powder, (b) MoO_3 powder, (c) $\text{MoO}_x\text{@HSS-0}$, (d) $\text{MoO}_x\text{@HSS-2}$ and (e) $\text{MoO}_x/\text{SiO}_2$. The broad peak seen at $2\theta = 15\text{-}30^\circ$ is attributed to amorphous nature of silica.

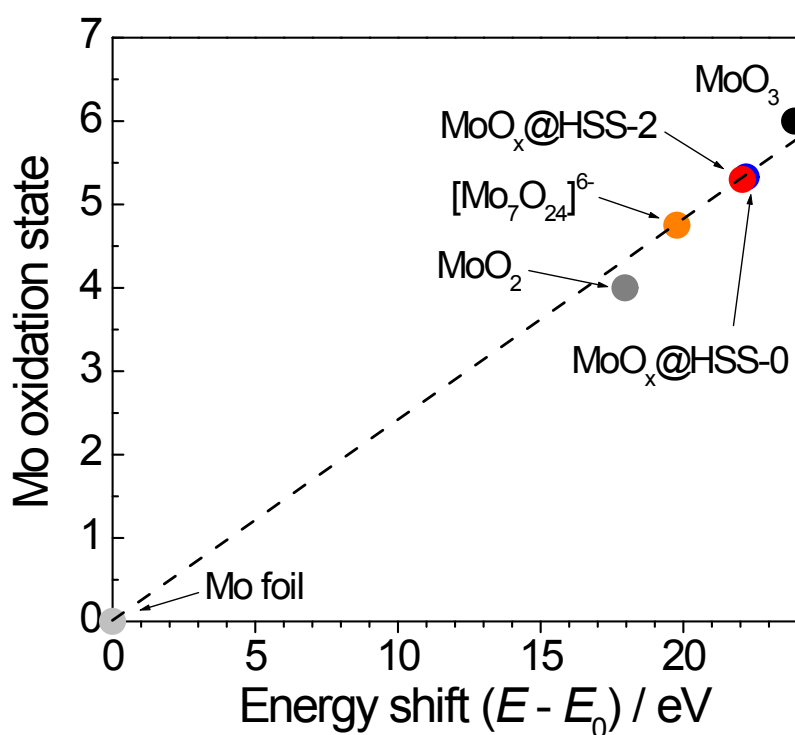


Fig. S6 Correlation between the energy shift (based on Mo foil) and oxidation state of Mo atoms in the prepared samples and reference Mo compounds.