Electronic Supplementary Information for Ionic liquid assisted hydrothermal synthesis of MoS_2 double-shell polyhedral cages with enhanced catalytic hydrogenation activities

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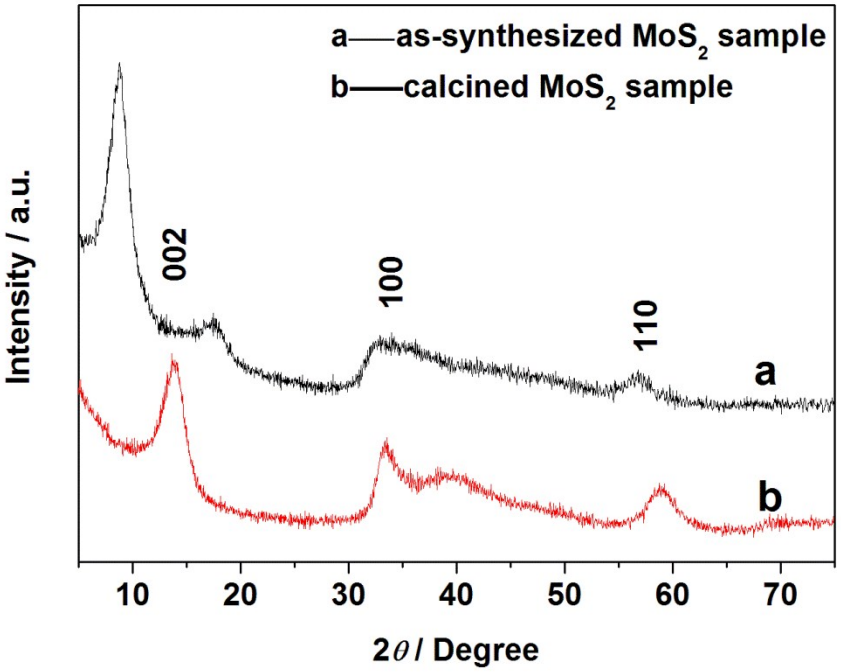

Figure S1 XRD patterns of (a) as-synthesized MoS_2 double-shell polyhedral cages sample and (b) calcined MoS_2 double-shell polyhedral cages sample at 350℃ under H_2 atmosphere for 2h.

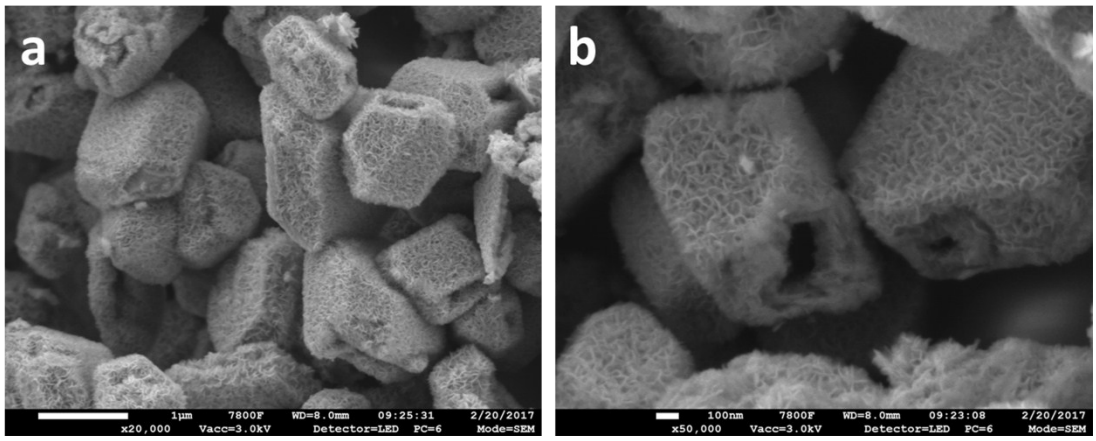

Figure S2 SEM images of calcined MoS_2 double-shell polyhedral cages sample at 350°C under H_2 atmosphere for 2h.

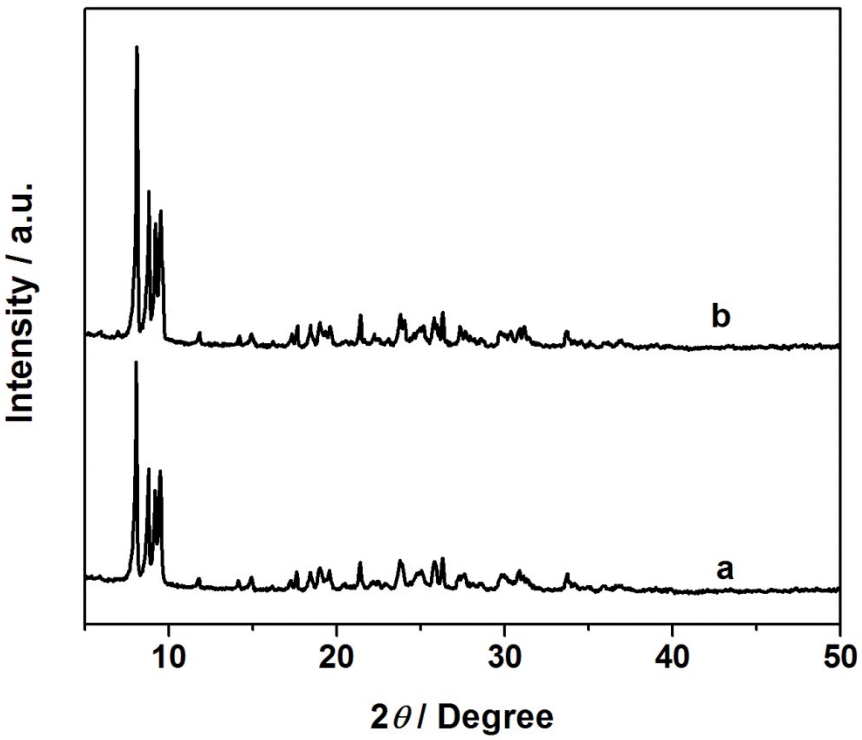

Figure S3 XRD patterns of (a) precursor MS-t-1 and (b) hydrothermal products of PMA and ILs after reaction for 1 h.

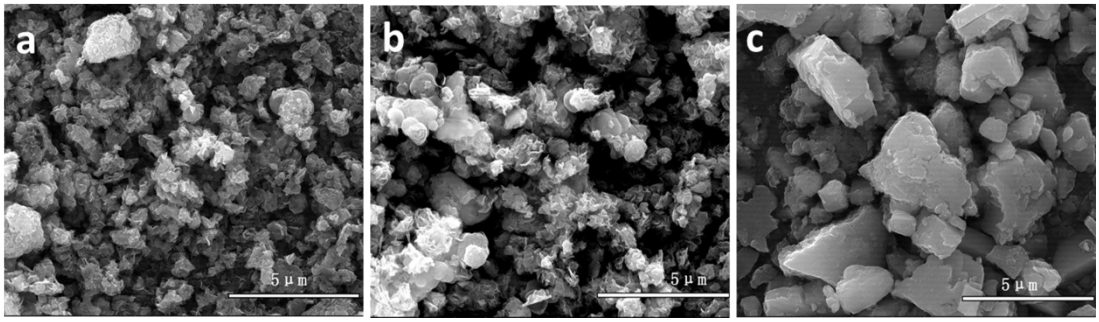

Figure S4 SEM images of MoS_2 products synthesized using (a) thioacetamide (CH_3CSNH_2), (b) thiourea ($CS(NH_2)_2$) and (c) elemental sulfur (S) as sulfur sources.

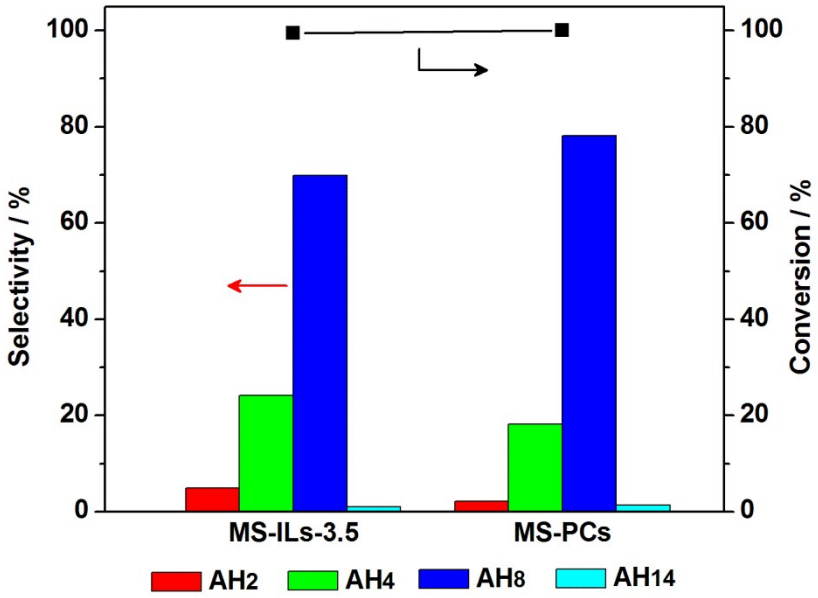

Figure S5 Selectivity and conversion of anthracene hydrogenation reaction using MoS_2 single-shell polyhedral cages MS-ILs-3.5 and double-shell polyhedral cages MS-PCs as catalysts. Reaction conditions: T = 350 °C, P_{H2} = 8 MPa, t = 4 h, 2.5 wt. % Cat.

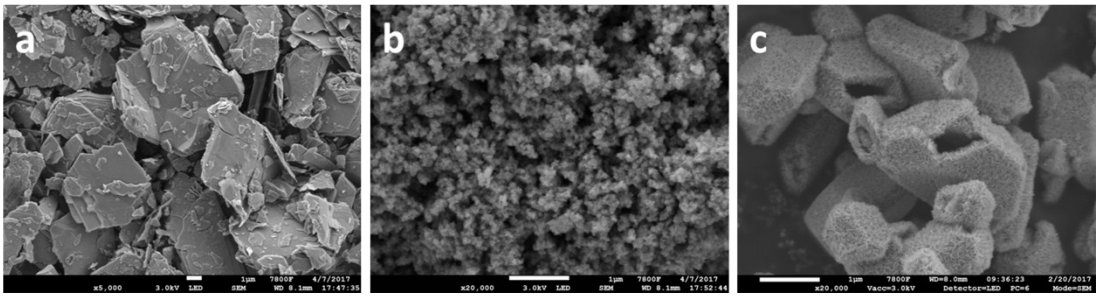

Figure S6 SEM images of (a) MS-com, (b) MS-NPs and (c) MS-PCs after anthracene hydrogenation reaction (Reaction conditions: T = 350 °C, PH2 = 8 MPa, t = 4 h).

After anthracene hydrogenation reaction, MS-Com was composed of micro-sized MoS_2 layers, MS-NPs were aggregates of nanoparticles and MS-PCs showed morphology of polyhedral cages, showing no obvious change of morphology. Thus the structural stability of as-synthesized MoS_2 samples was very well.