SUPPORTING INFORMATION

Ultrasmall Ni-promoted WS_2 nanocatalyst with enhanced number of edge atoms for hydrodesulfurization

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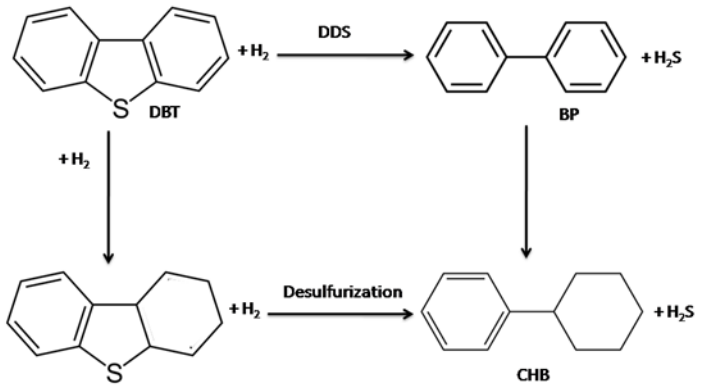
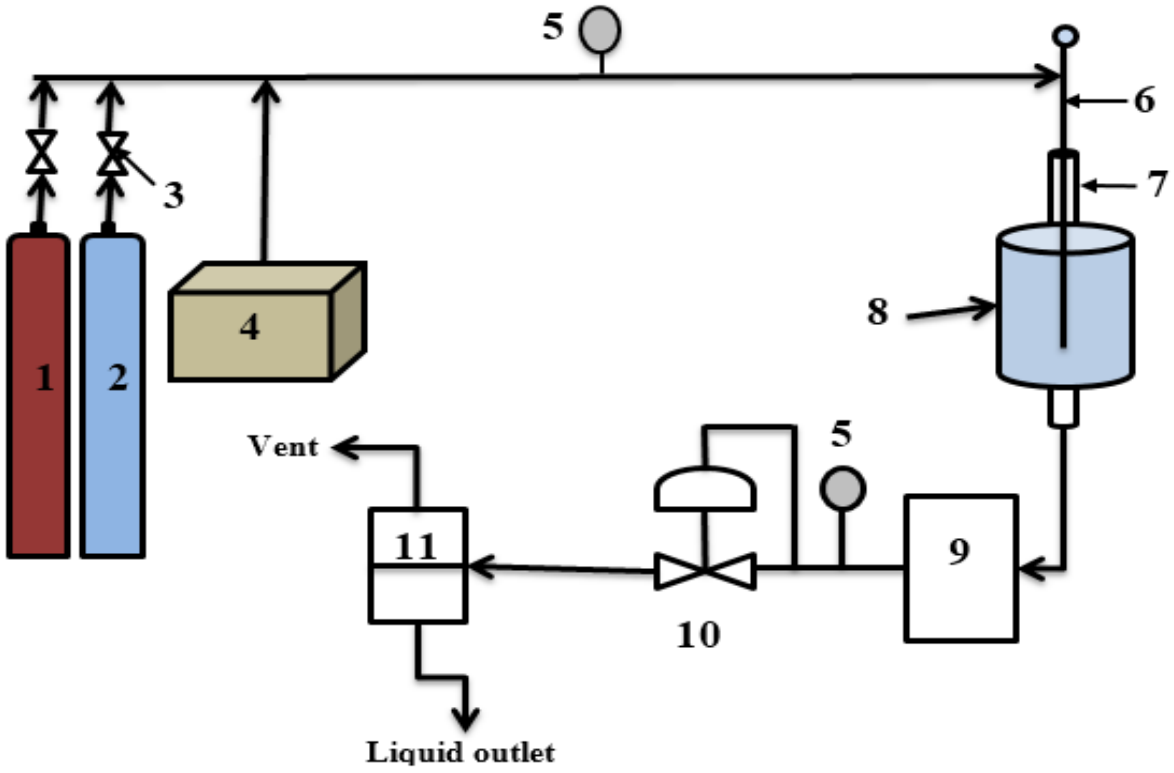


Figure S1. Reaction pathways for the hydrodesulfurization of dibenzothiophene



1) Hydrogen Cylinder 2) Helium Cylinder 3) Mass flow controller 4) HPLC pump 5) Pressure gauge 6) Thermocouple 7) Reactor 8) Furnace 9) Condenser 10) Back pressure regulator 11) Gas liquid separator

Figure S2. Schematic diagram of experimental setup

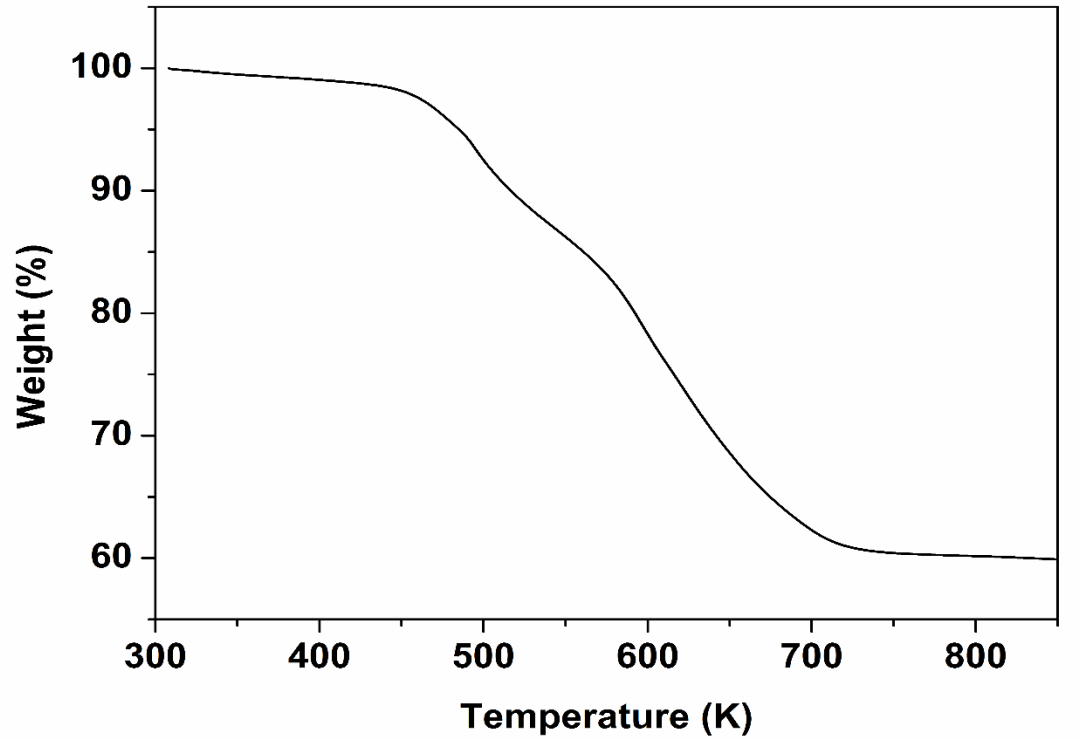


Figure S3. TGA analysis of unsupported Ni-promoted WO_3 nanoclusters

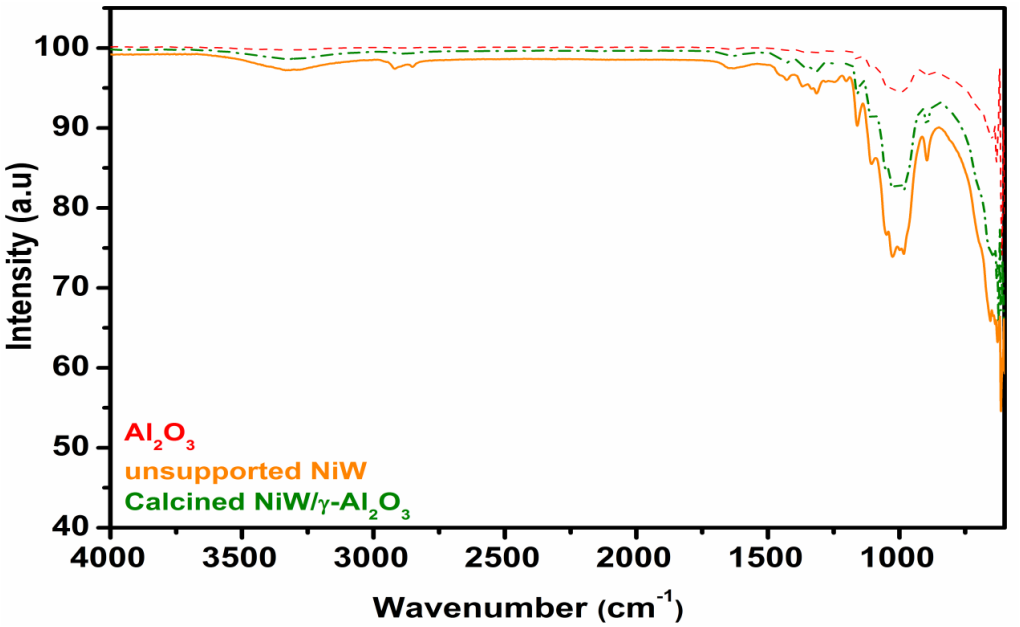


Figure S4. FT-IR spectra of Ni-promoted WO_3 nanoclusters

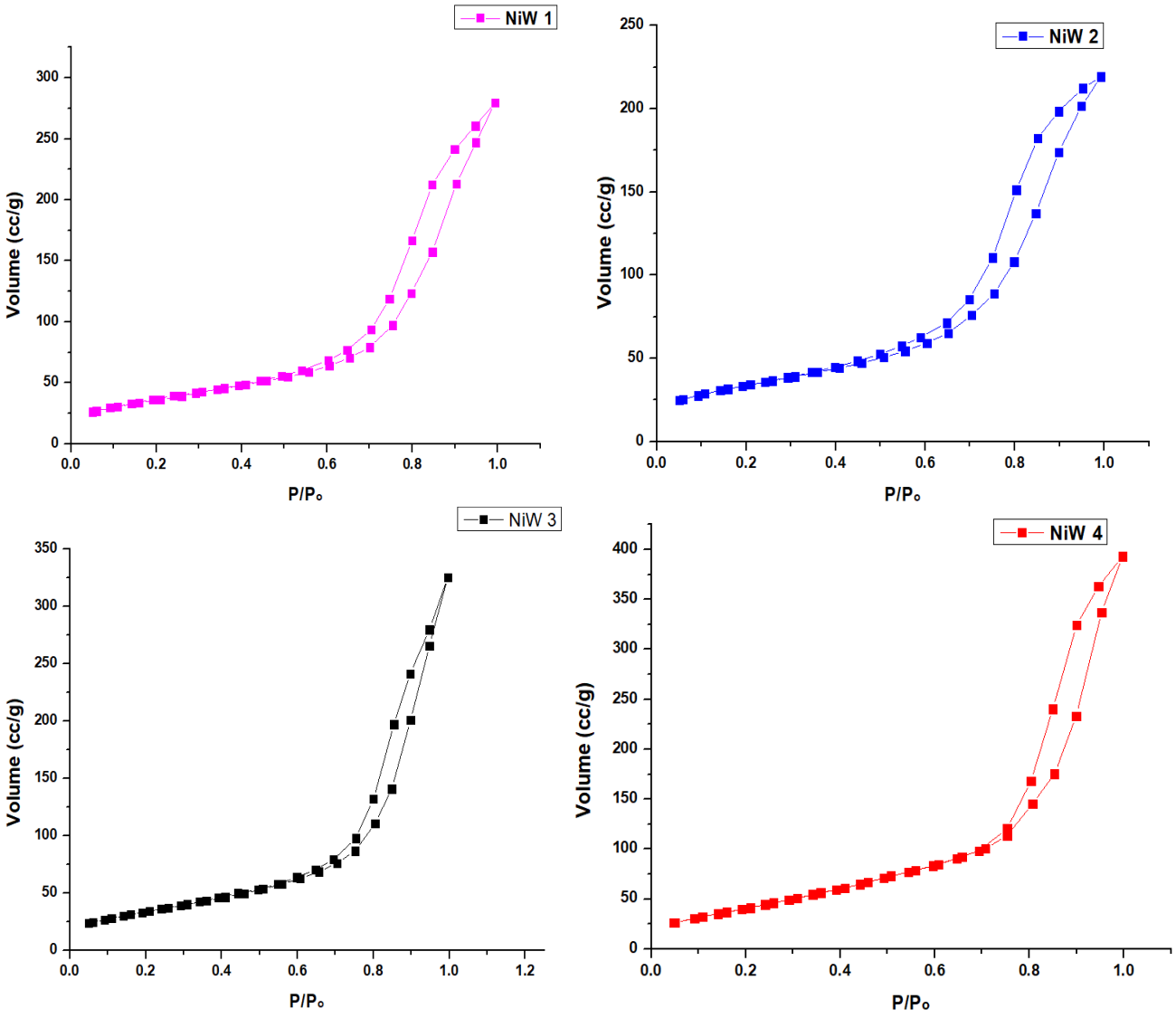


Figure S5. Physisorption isotherms of NiW 1-4 catalysts

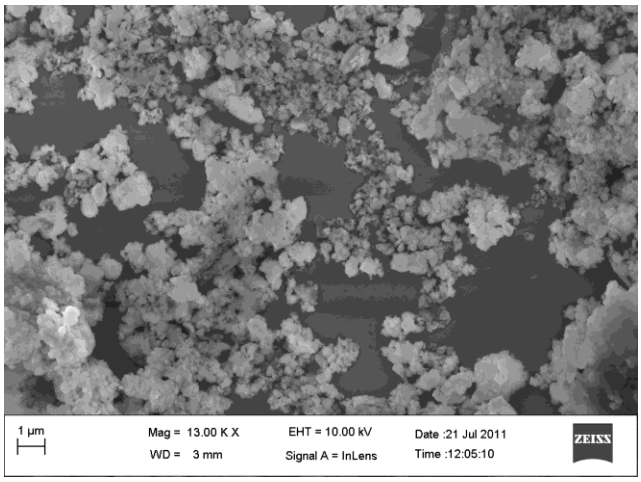


Figure S6. SEM image of NiW 2 catalyst

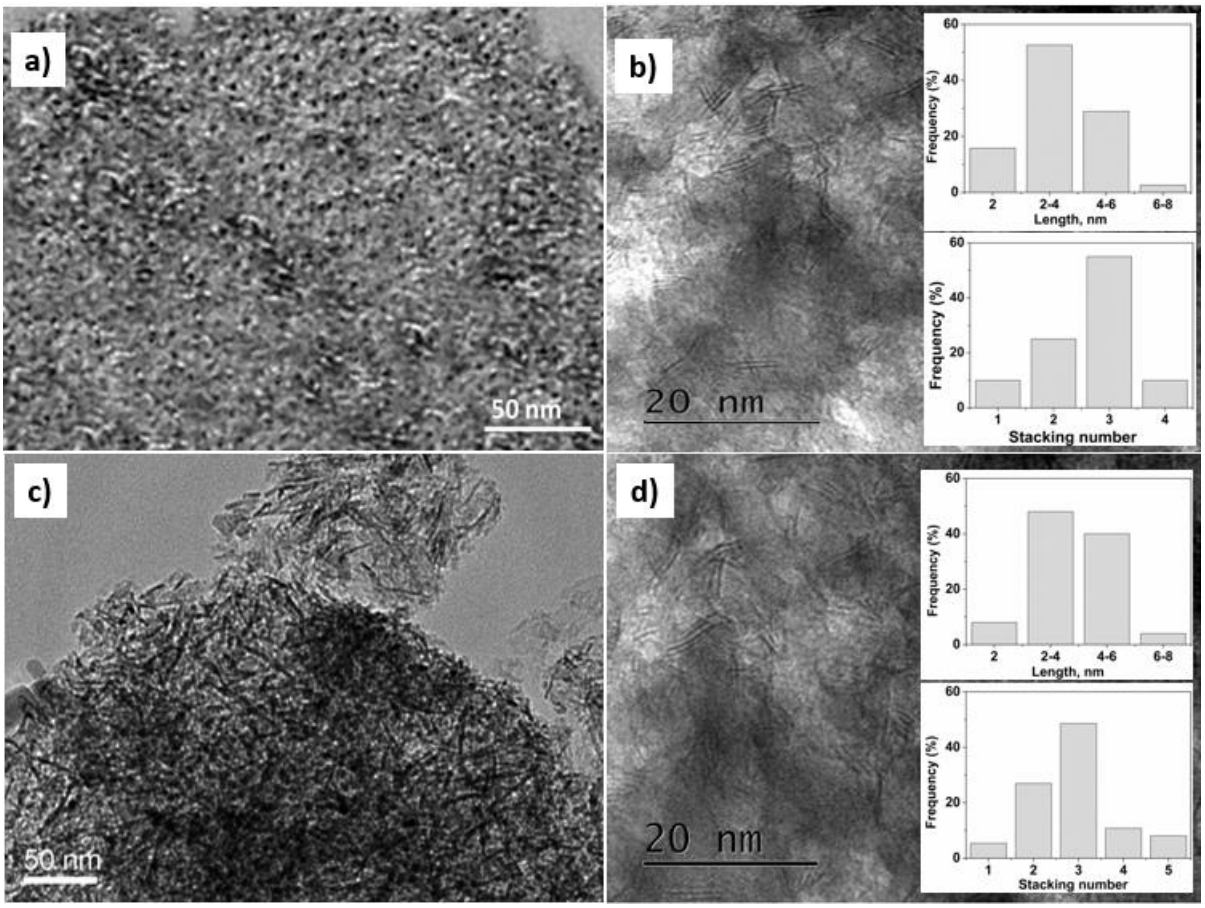


Figure S7. HRTEM images a) NiW 2 b) sulfided-NiW 2 c) NiW C1 d) sulfided NiW C1

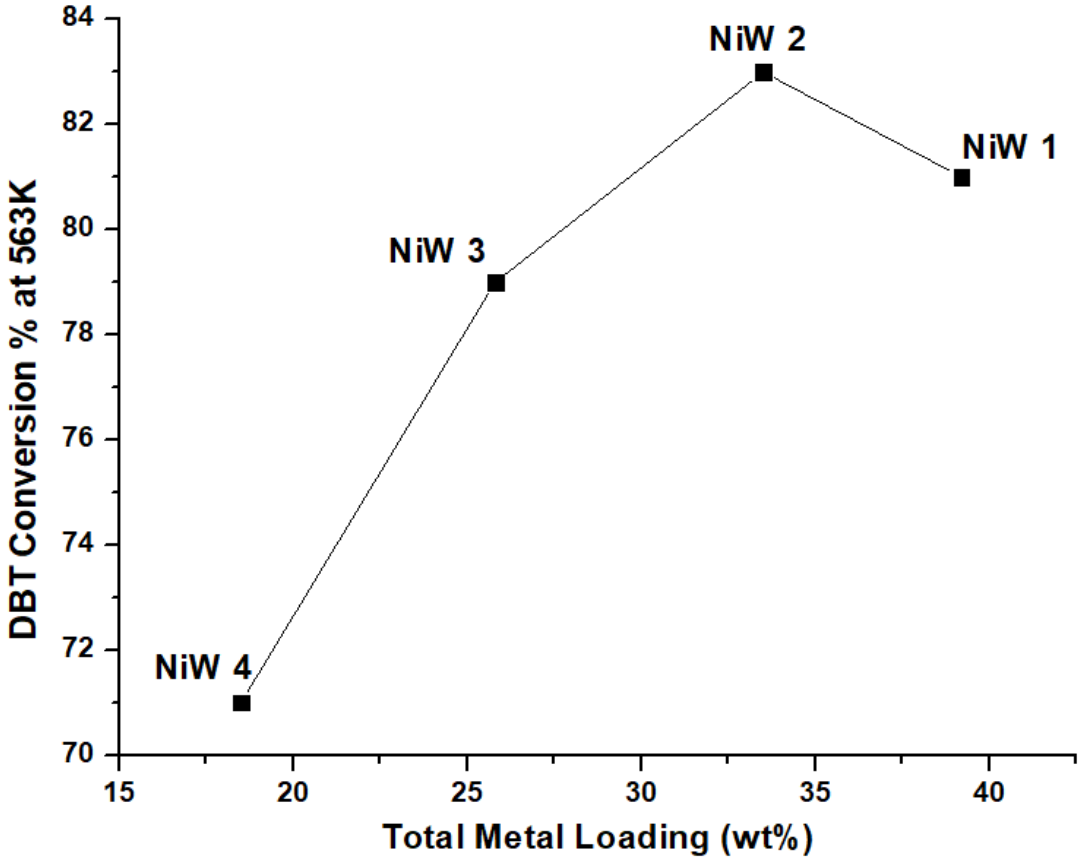


Figure S8. DBT conversion vs. total metal loading plot at 563K temperature

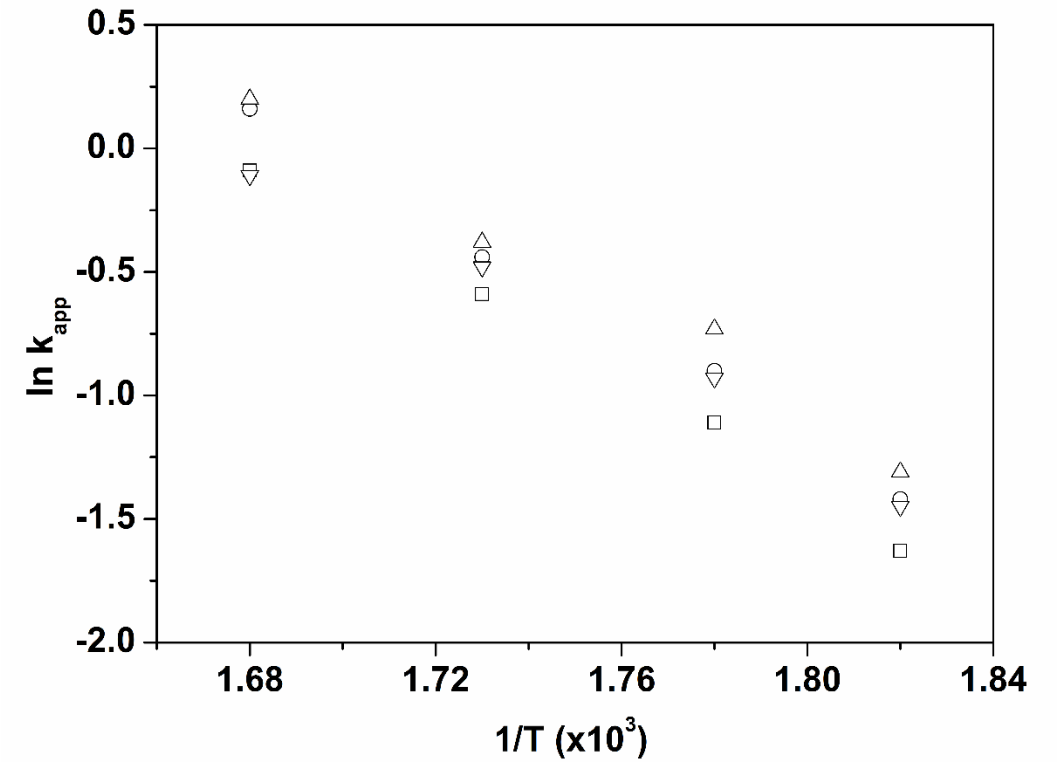


Figure S9. Arrhenius plot for the different Ni-promoted WS_2 nanocatalyst. NiW 1(□); NiW 2(○); NiW 3(△) and NiW 4 (▽)

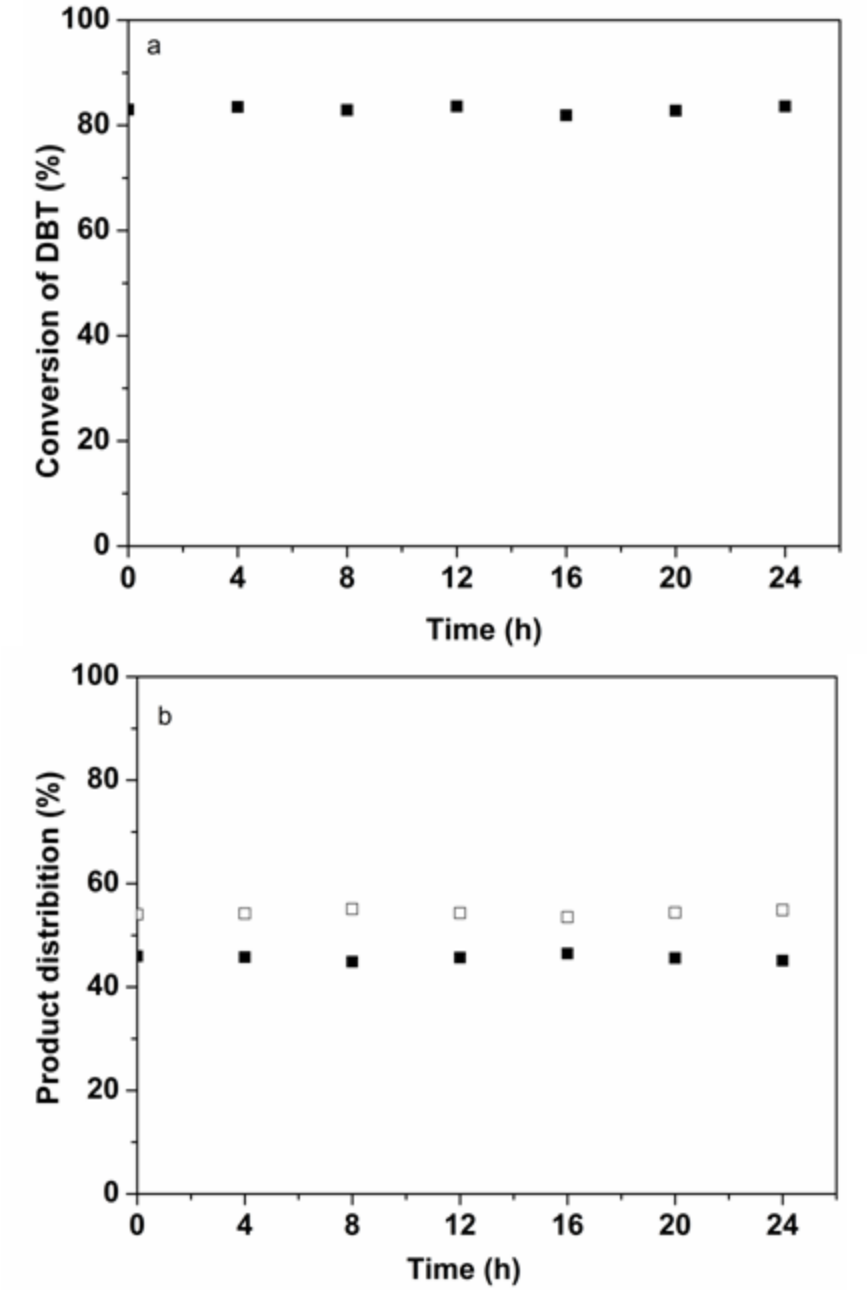


Figure S10. Stability test for Ni-promoted WS_2 nanocatalyst under HDS reaction conditions (T= 563 K, amount of catalyst used= 150 mg, W/F_{Ao}= 2.38 x10^2 (kg cat.h/(kmol DBT)). Effect of time on (a) HDS activity, (b) product selectivity

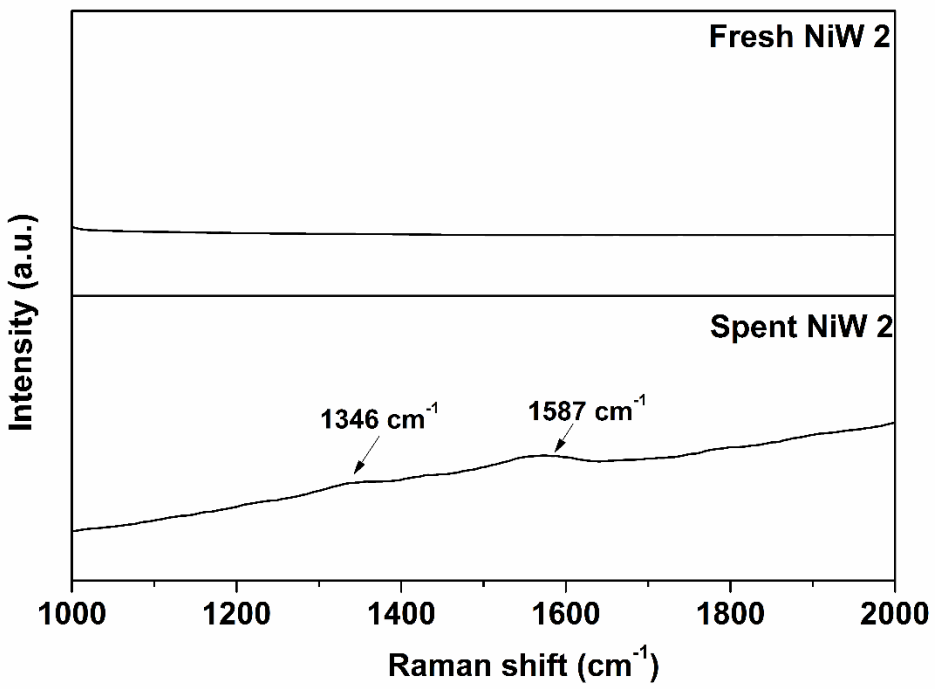


Figure S11. Raman spectra of NiW 2 catalyst.

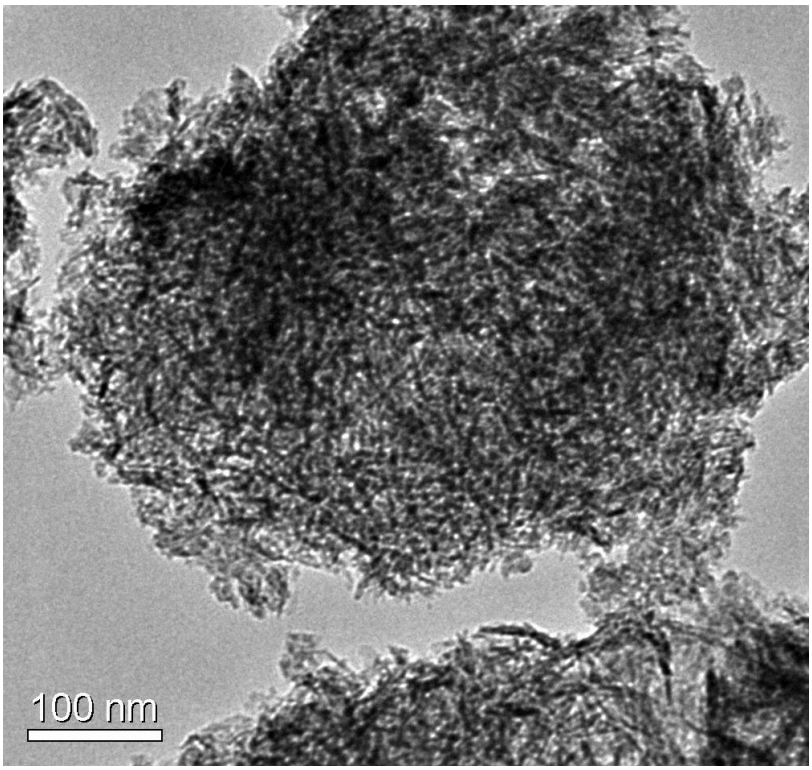


Figure S12. HRTEM image of spent NiW 2