

Supporting Information

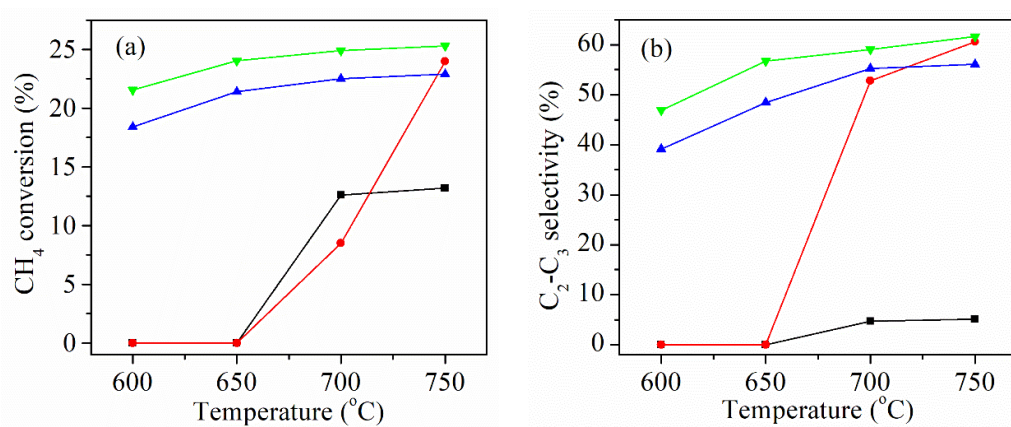


Figure S1. Comparison of catalytic performances of our catalyst 0.04Sr-Ho₂O₃ and three reference catalysts at different temperatures: (a) CH₄ conversion and (b) C₂-C₃ selectivity. (▼) 0.04Sr-Ho₂O₃-NS, (▲) 0.04Sr-La₂O₃, (●) 3%Li/MgO, (■) 0.04Sr-CeO₂.

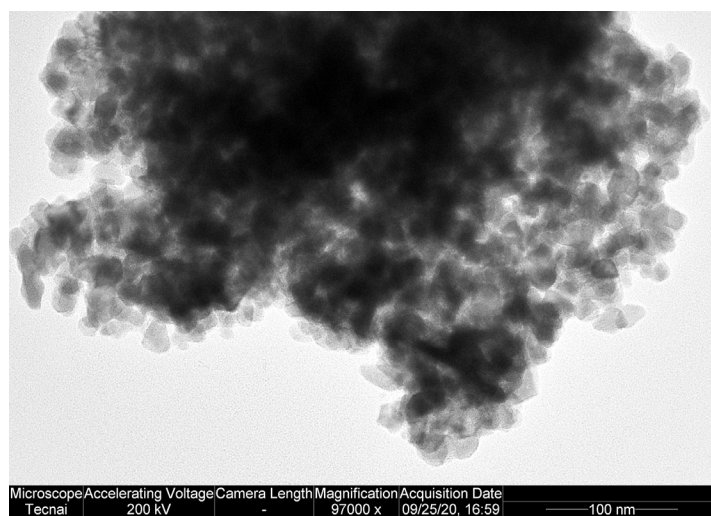


Figure S2. TEM image of $\text{Ho}_2\text{O}_3\text{-NP}$.

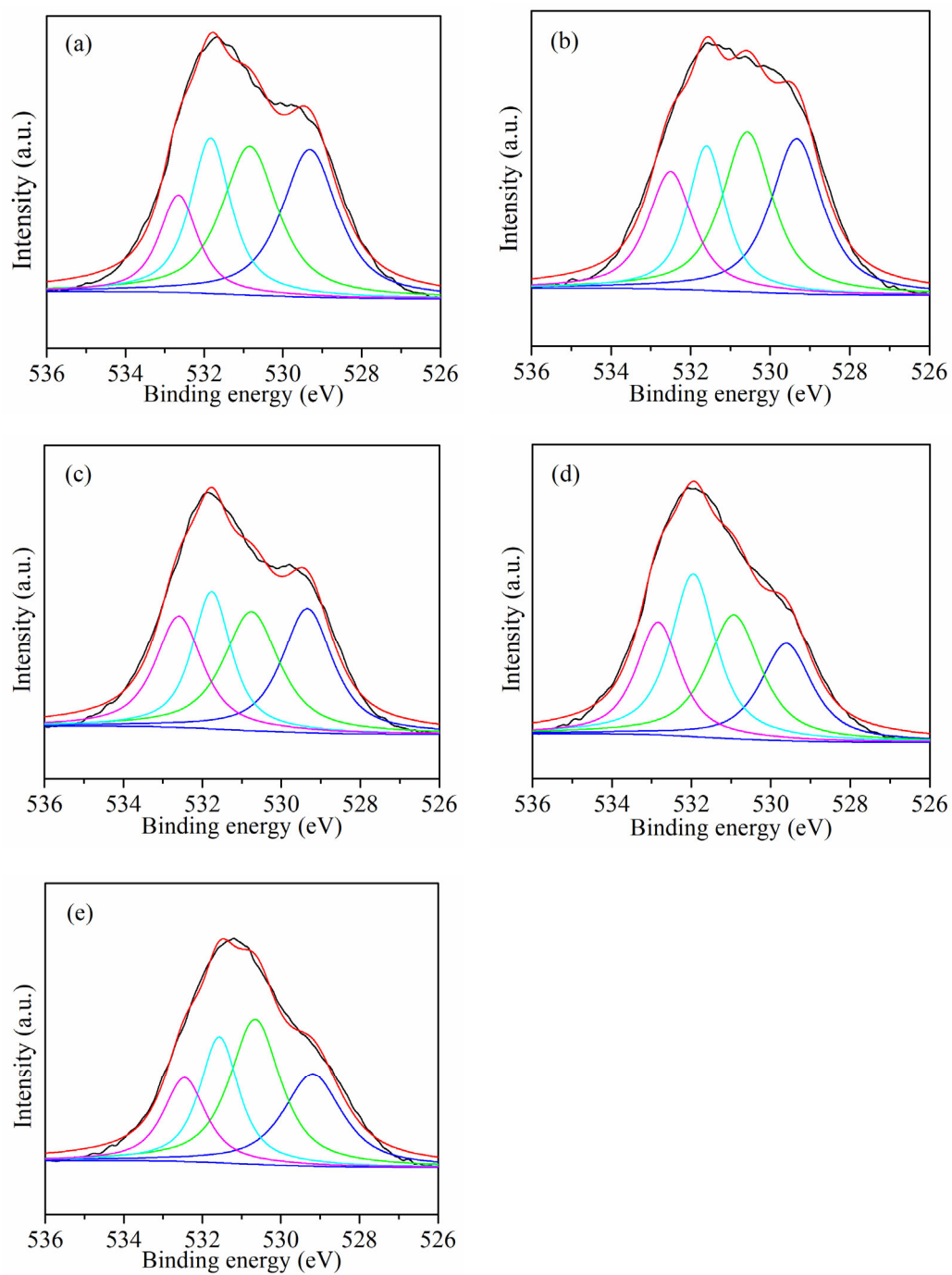


Figure S3. XPS spectra of O 1s on Ho_2O_3 -NP (a), Ho_2O_3 -NS (b), 0.02Sr- Ho_2O_3 -NS (c), 0.04Sr- Ho_2O_3 -NS (d) and 0.06Sr- Ho_2O_3 -NS (e).

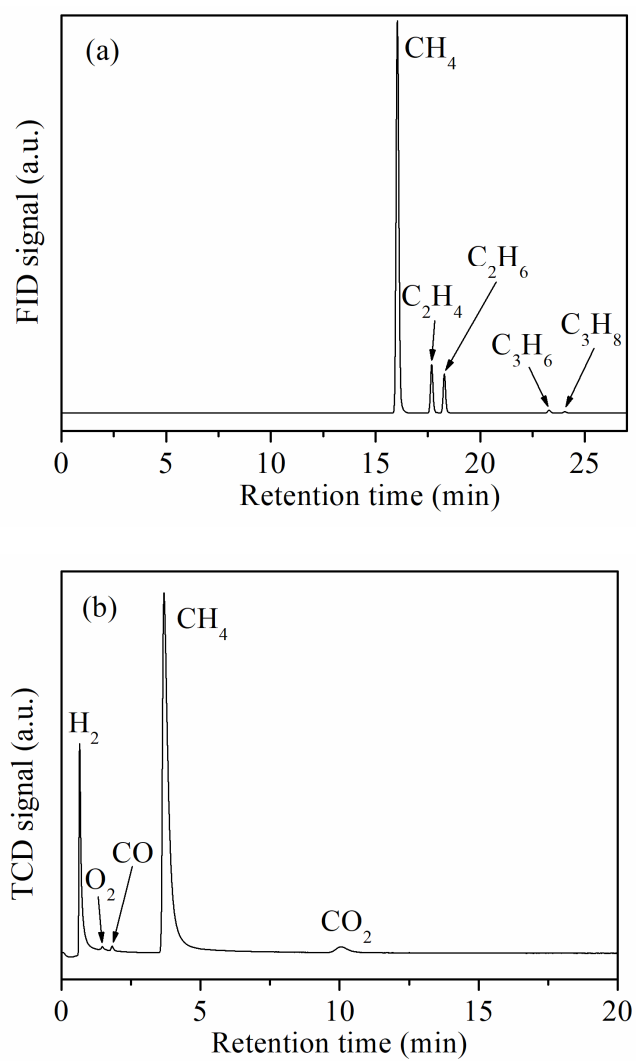
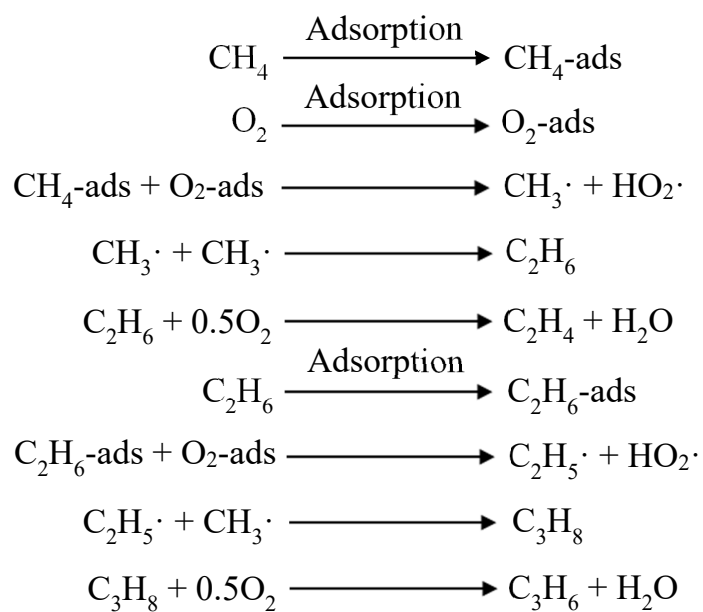


Figure S4. The typical GC chromatograms detected by a FID (a) and a TCD (b).



Scheme S1. Proposed reaction mechanism of methane transformation to ethane, ethylene, propane and propylene.