

Supplementary Materials

Studies of Nickel/Samarium-Doped Ceria for Catalytic Partial Oxidation of Methane and Effect of Oxygen Vacancy

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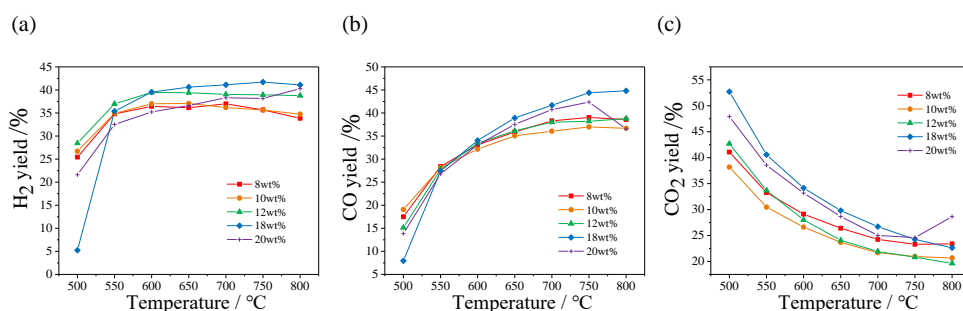


Figure S1. Product yield of on the $\text{Sm}_{0.1}\text{Ce}_{0.9}\text{O}_{1.95}$ catalyst with various Ni contents in the gas stream, CH_4/O_2 (10/5, vol.%) in Ar at a total flow rate of 30 ml min⁻¹ (calculated by: 100% x practical yield/ theoretical yield).

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S2. Increasing NiO loadings usually gives rise to a bigger particles size with a sharper XRD peak, as shown on the figure below.

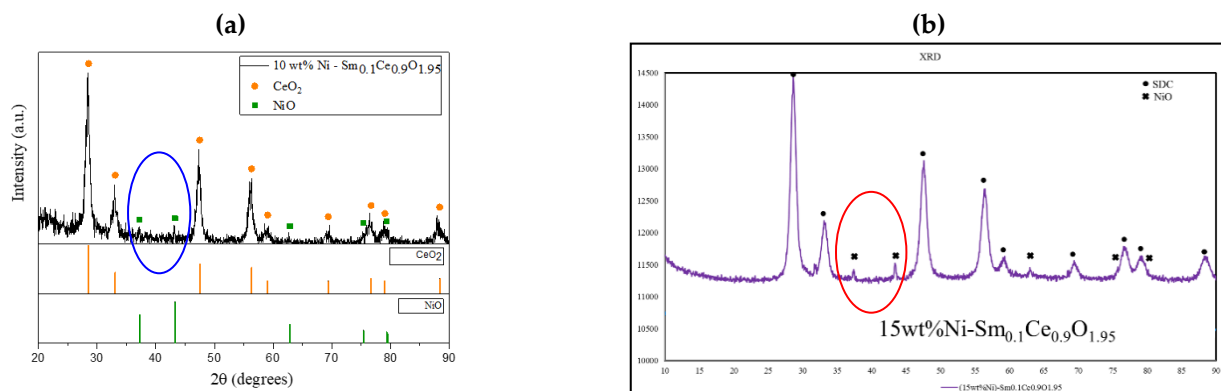


Figure 2. XRD pattern on (a) 10 wt. % Ni/SDC and (b) 15 wt.% Ni/SDC catalyst.

S3. XPS result shows that Ce contains different valence state because of Sm doping.
 $\text{Ce}^{4+} = v, v'', v''', u, u'', u'''; \text{Ce}^{3+} = v_0, v', u_0, u'$

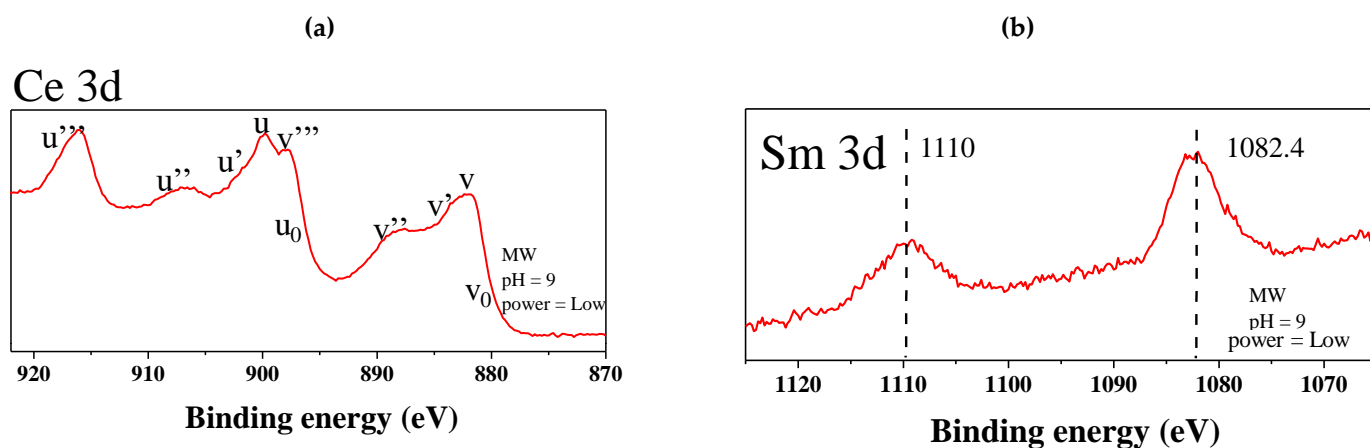


Figure S3. Experimental Ce3d and Sm 3d XPS spectra on 10 wt.% Ni/SDC (Sm/Ce=1/9).

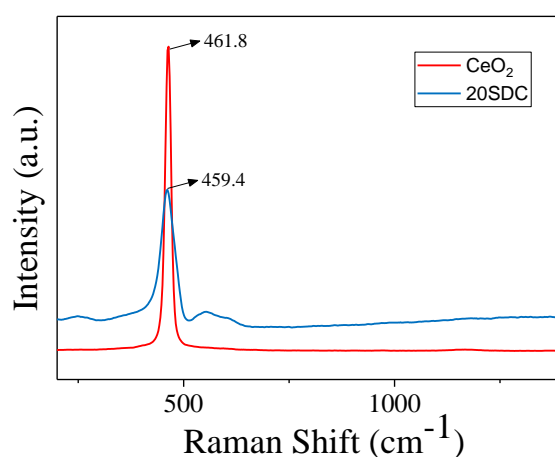


Figure S4. Raman analysis on the commercial CeO_2 and as-synthesized SDC.