Electronic Supplementary Material (ESI) for Sustainable Energy & Fuels.

Supporting Information for:

Kinetic Investigation of Solar Chemical Looping Reforming of Methane over Ni-CeO_2 at Low Temperature

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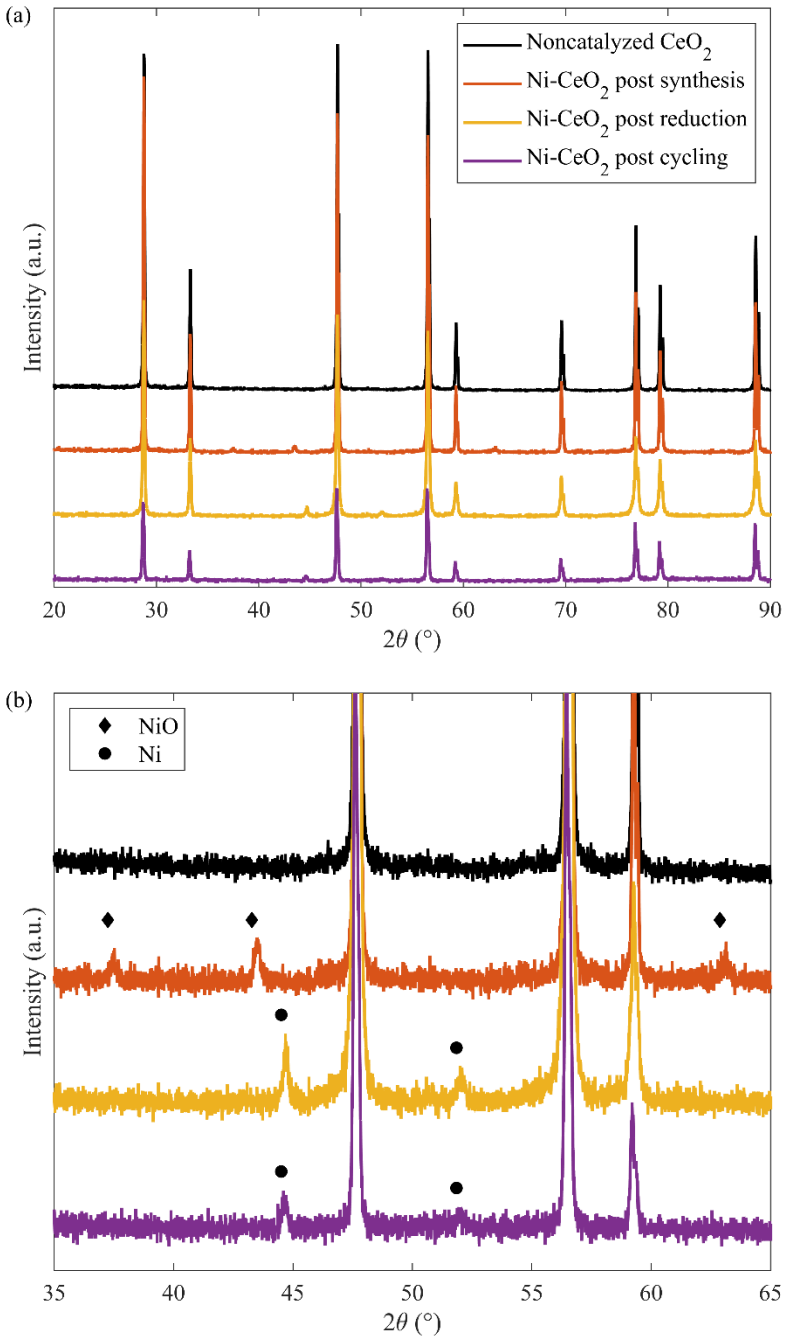


Figure S1. PXRD patterns for noncatalyzed CeO_2 (black), Ni-CeO_2 after synthesis (red), Ni-CeO_2 following the first reduction (yellow), and Ni-CeO_2 after 200 CLRM cycles at 700 ℃ (purple) over 2θ ranges of a) 20-90° and b) 35-65°. Alignment of peaks with patterns for NiO (diamonds) or Ni (circles) are indicated in subfigure b. Note all scans were collected for LP CeO_2 or LP Ni-CeO_2.

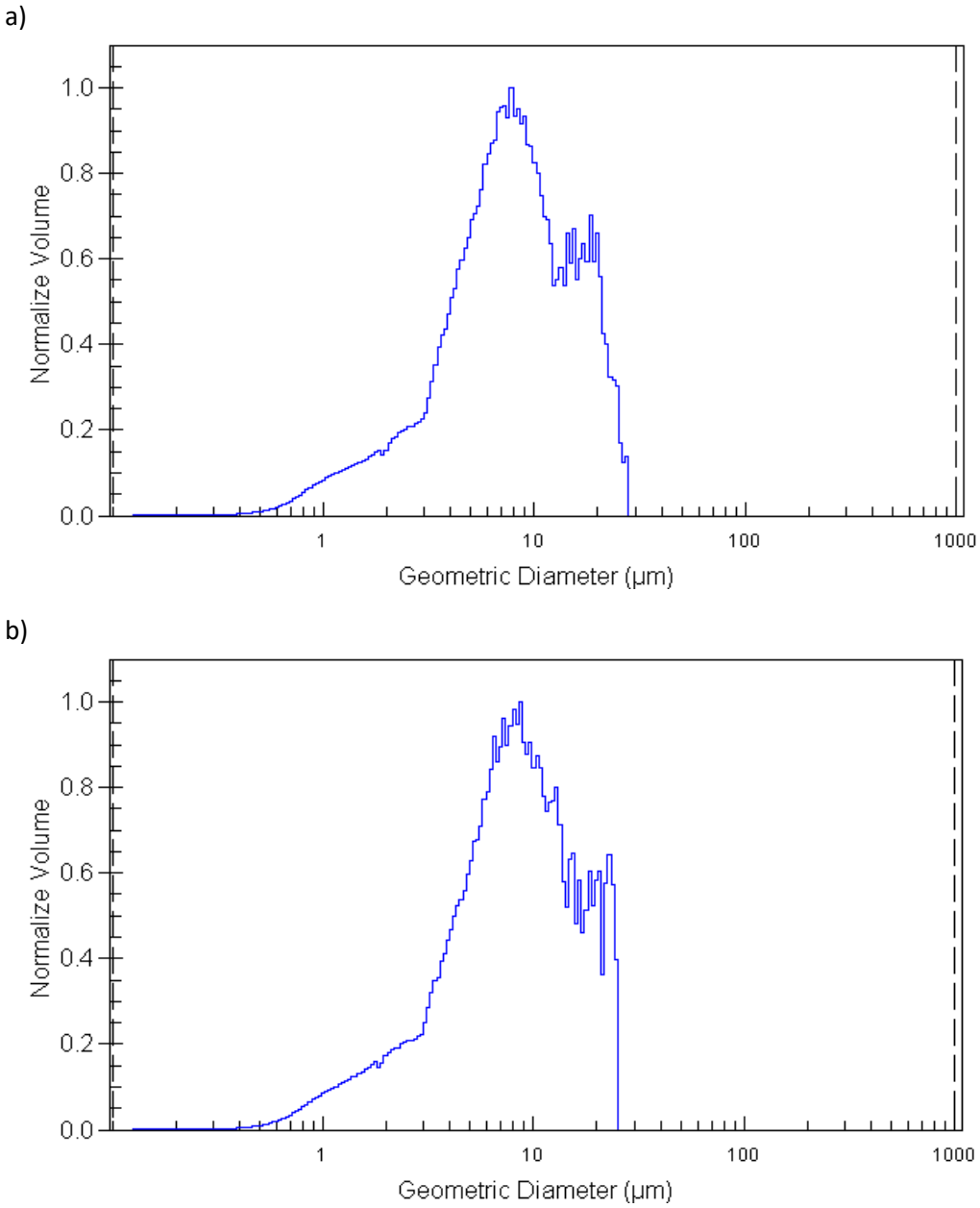


Figure S2. Particle size distribution for a) CeO_2 and b) Ni-CeO_2 powder samples displayed as normalized volume versus the geometric diameter.

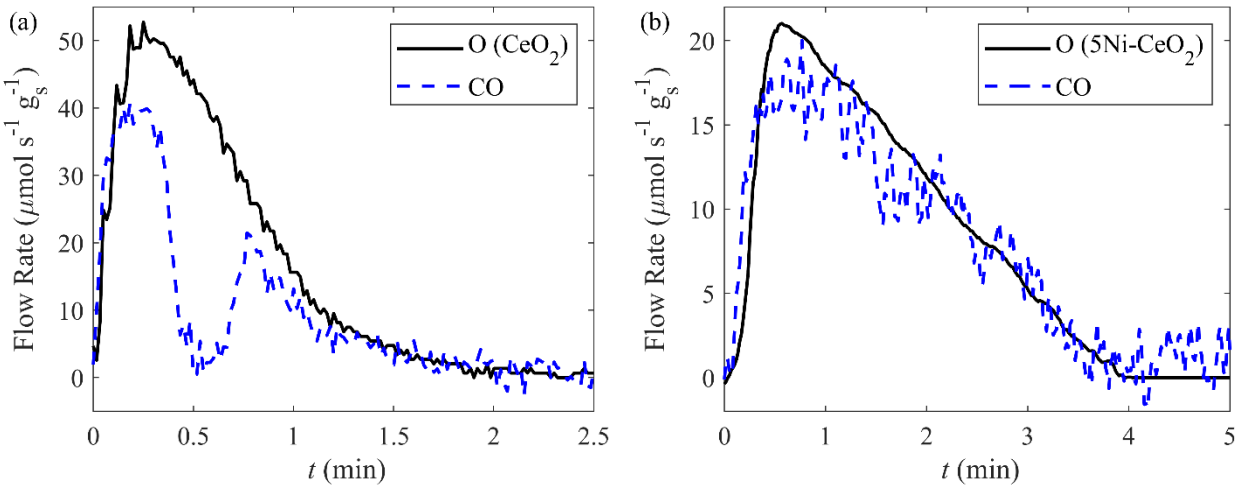
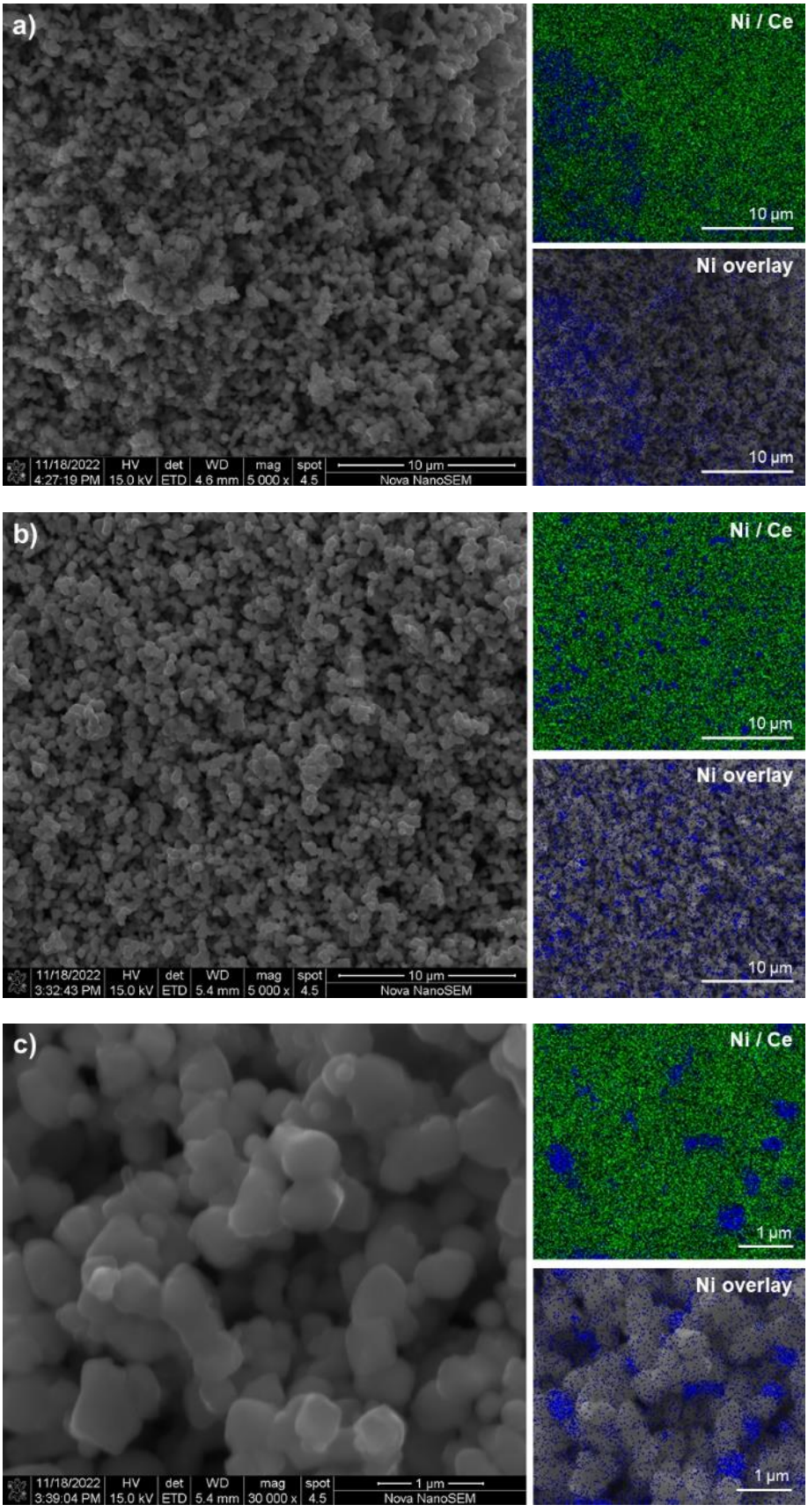


Figure S3. Specific molar rate of monatomic oxygen absorbed by the sample, determined from the derivative of the mass change, and specific molar flow rate of CO measured during oxidation of a) CeO_2 and b) Ni-CeO_2 during isothermal cycling at 800 ℃.


a)
11/18/2022 | HV | det | WD | mag | spot
4:27:19 PM | 15.0 kV | ETD | 4.6 mm | 5 000 x | 4.5
10 µm
Nova NanoSEM
Ni / Ce
10 µm
Ni overlay
10 µm
b)
11/18/2022 | HV | det | WD | mag | spot
3:32:43 PM | 15.0 kV | ETD | 5.4 mm | 5 000 x | 4.5
10 µm
Nova NanoSEM
Ni / Ce
10 µm
Ni overlay
10 µm
c)
11/18/2022 | HV | det | WD | mag | spot
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1 µm
Nova NanoSEM
Ni / Ce
1 µm
Ni overlay
1 µm

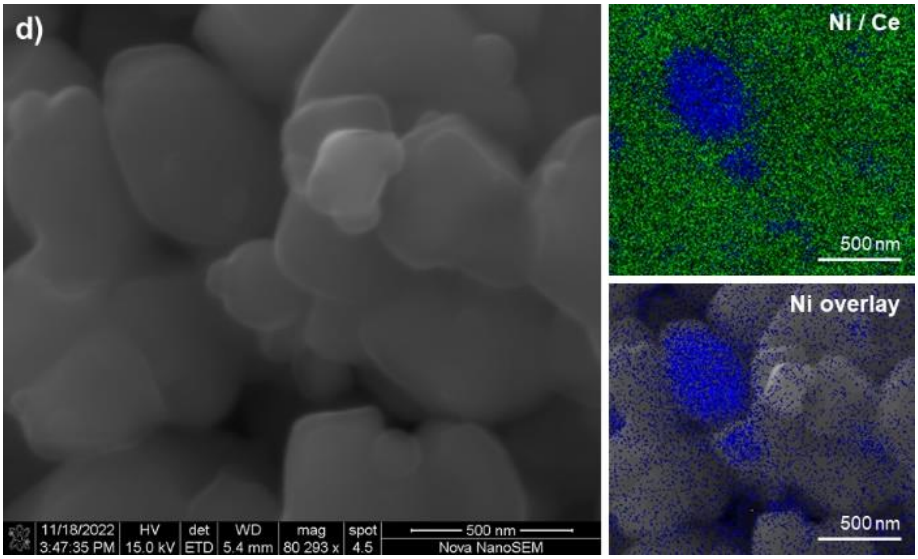

Figure S4. SEM images, EDS element mappings (Ni: blue, Ce: green), and EDS Ni mapping overlayed with SEM imaging for LP Ni-CeO_2 a) after synthesis at 5,000x magnification, b) post cycling at 5,000x magnification, c) post cycling at 30,000x magnification, and d) post cycling at 80,000x magnification.