Support Information

Strong Metal-Support Interactions Ni-CeO_2 Effectively Improves the Performance of Molten Hydroxide Direct Carbon Fuel Cell

Xiaofeng Li [a,1], Xiaohui Liu [a,1], Jiamao Hao [b], Lijun Li [a], Yanfang Gao [a,*], Yousong Gu [b,*], Zhenzhu Cao [a] and Jinrong Liu [a,**]

[a] *College of Chemical Engineering, Inner Mongolia University of Technology, Hohhot, 010051, P.R. China*

[b] *School of Materials Science and Engineering, University of Science and Technology Beijing, BeiJing, 100083, P.R. China*

E-mail addresses: yf_gao@imut.edu.cn

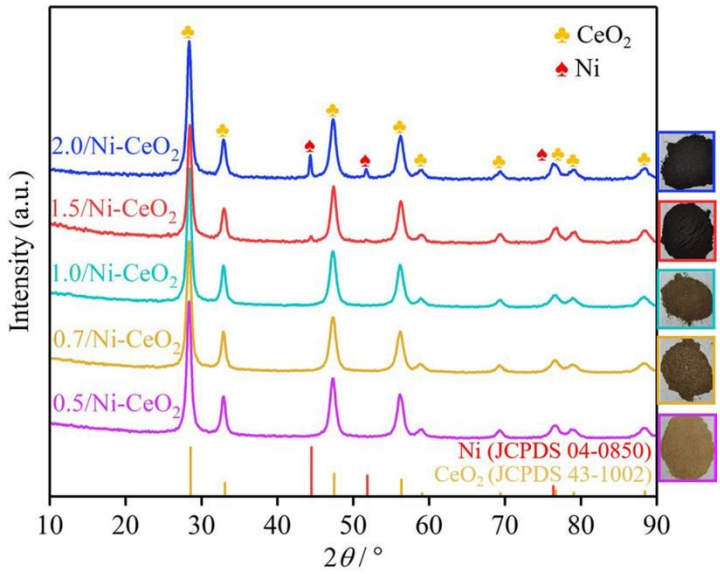


Figure S1. The xrd patterns and photographs of sample Ni-CeO_2 under different Ni/Ce ratios.

Table S1 The mass contents of Ni in different samples were measured by ICP

Sample	Sample contents (mg mL^{-1})	Ni (10^{-3} mg mL^{-1})	Ni (%)
0.5/Ni-CeO_2	0.4	0.87	0.22
0.7/Ni-CeO_2	0.4	1.23	0.31
1.0/Ni-CeO_2	0.4	4.27	1.07
1.5/Ni-CeO_2	0.4	13.11	3.28
2.0/Ni-CeO_2	0.4	16.79	4.20
1.5/Ni@CeO_2	0.4	21.03	5.26

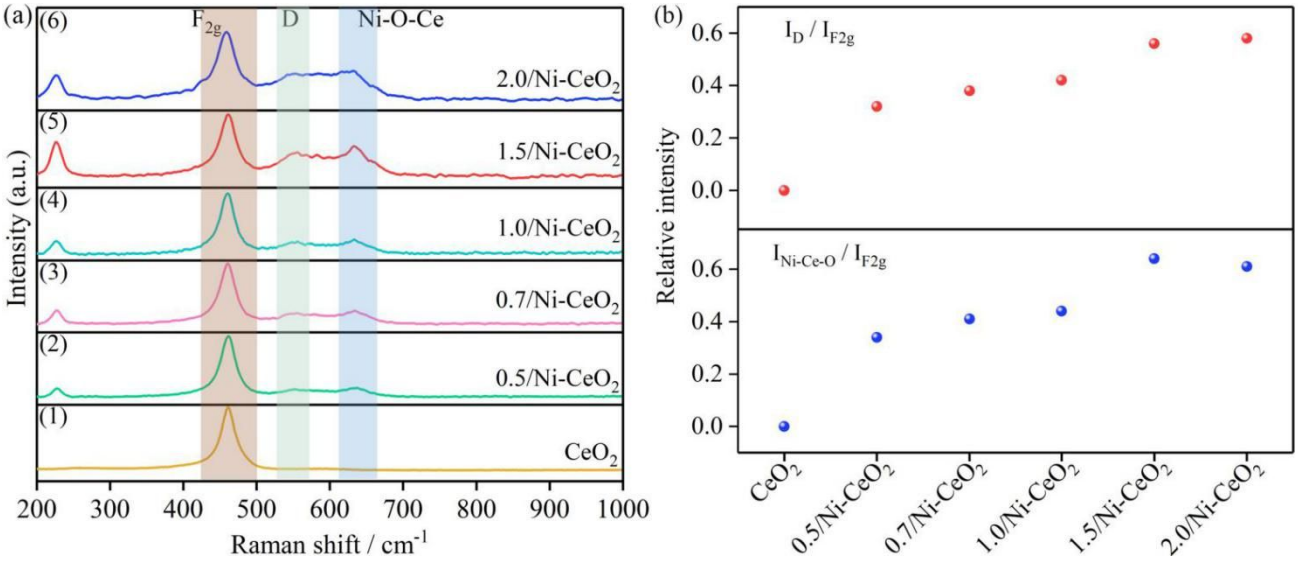


Figure S2. Raman spectra of samples Ni-CeO_2 with different Ni/Ce ratios(a); Relative strength ratio （ID/IF2g, INi-Ce-O/IF2g）(b).

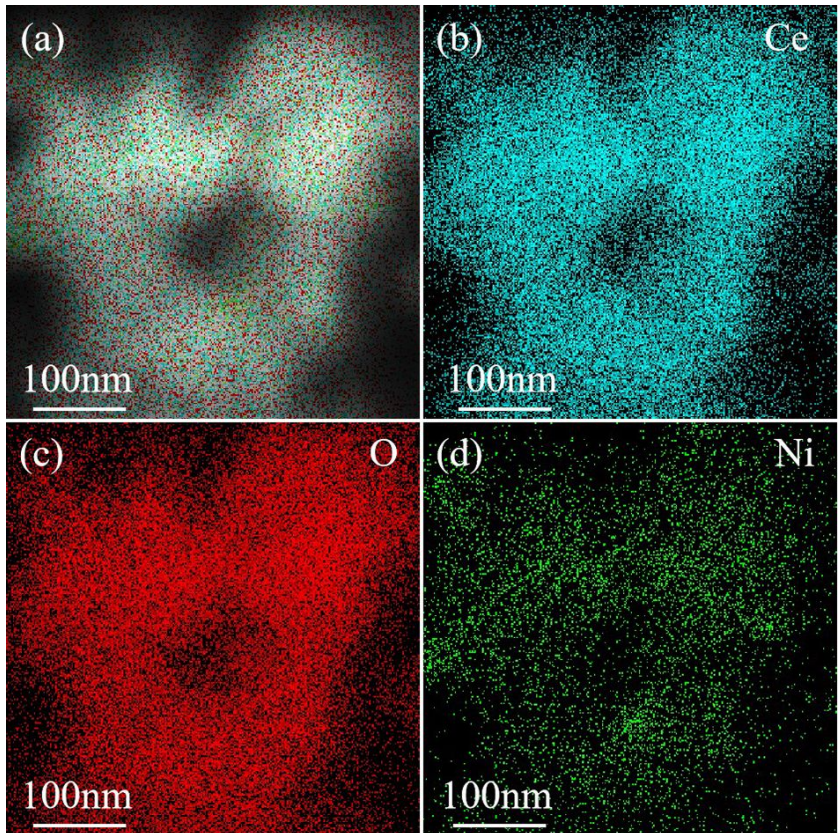


Figure S3. The TEM-EDS image of Ni-CeO_2; (a) EDS layered image; (b) Ce; (c) O; (d) Ni.

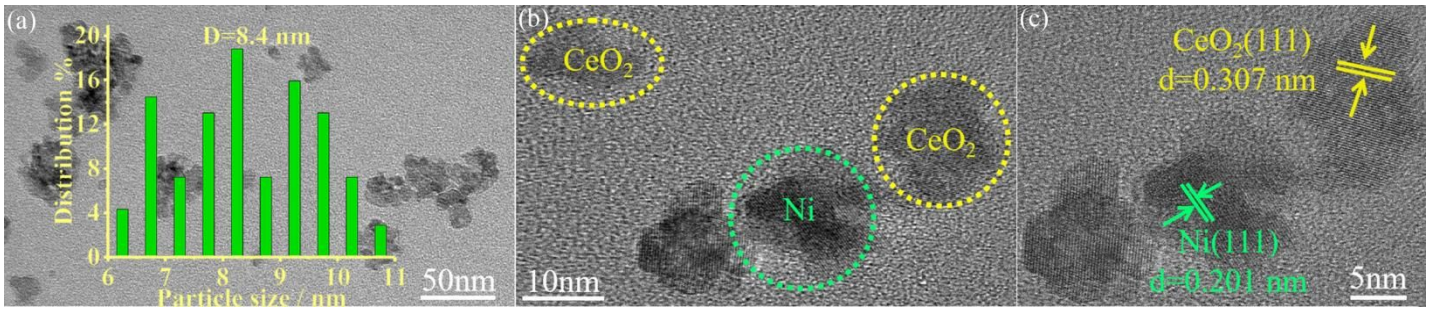
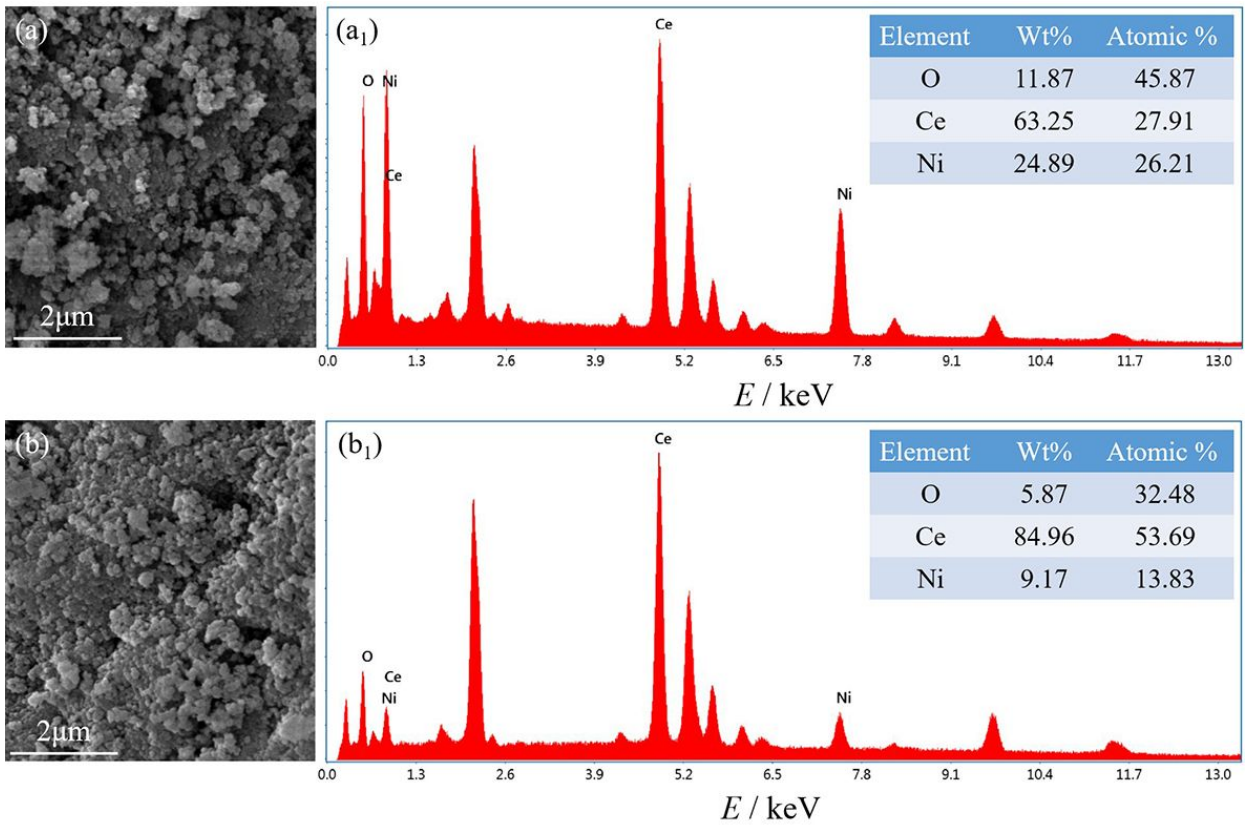


Figure S4. TEM and HRTEM images of Ni@CeO_2; (a) TEM and particle size distribution; (b), (c) HRTEM.



Element	Wt%	Atomic %
O	11.87	45.87
Ce	63.25	27.91
Ni	24.89	26.21

Element	Wt%	Atomic %
O	5.87	32.48
Ce	84.96	53.69
Ni	9.17	13.83

Figure S5. SEM and EDS spectrum diagram (a) Ni@CeO_2; (b) Ni-CeO_2.

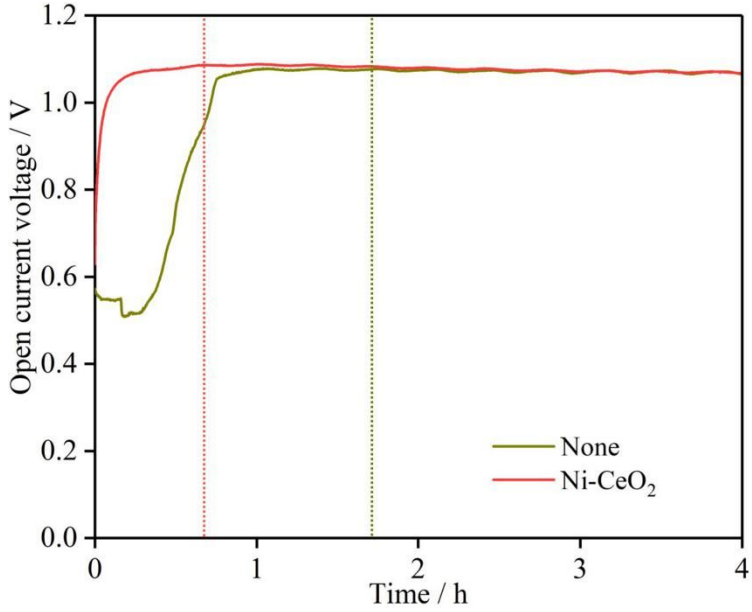


Figure S6. The chronopotentiometry curves of with and without Ni-CeO_2, respectively.

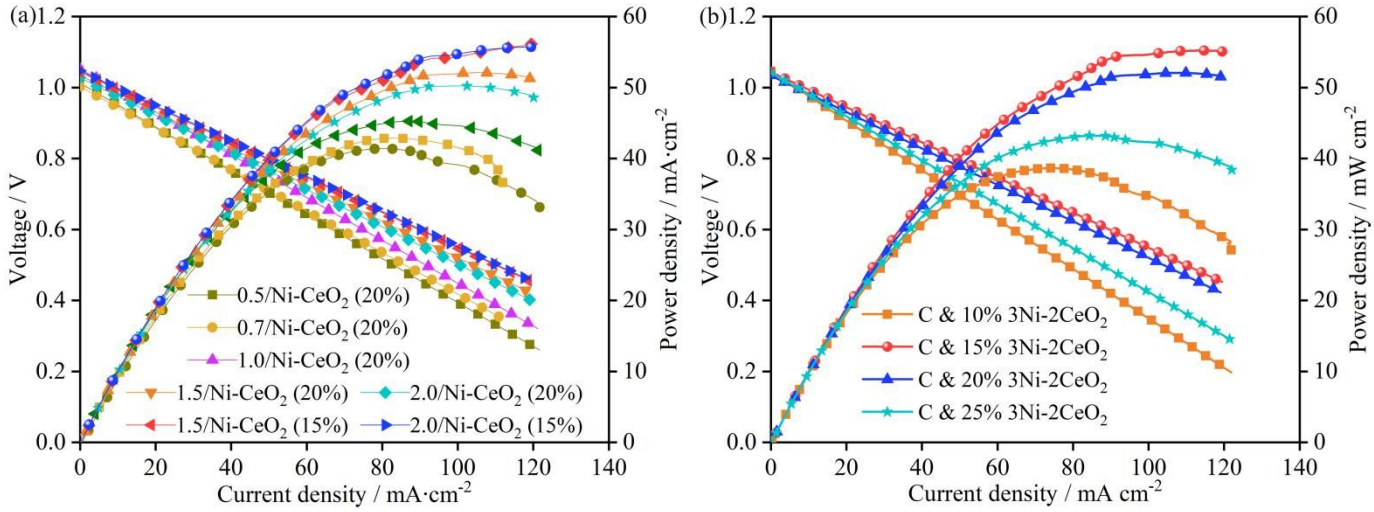


Figure S7. The electrochemical performance of MHDCFC at electrolyte NaOH-KOH (mole ratio of 1:1). (a) The *V-I-P* curves of different molar ratio of Ni-Ce. (b) .The *V-I-P* curves of different contents of Ni-CeO_2.

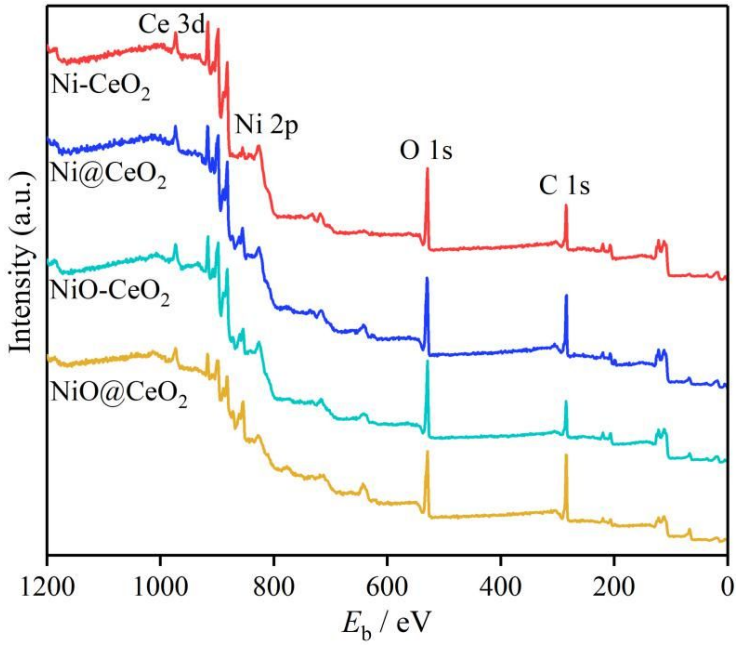


Figure S8. XPS survey spectra of different materials.