Supplementary Materials for

Chemical-looping Combustion over Lanthanum Nickel Perovskite-type Oxygen Carrier with Facilitated O^{2-} Transport

The PDF file includes:

Table S1. Performance comparisons of the redox catalyst in this study versus the recently published catalysts on methane CLC processes.

Figure S1. Five cycles redox TGA data for $La_{0.1}Ca_{0.9}Cu_{0.1}Ni_{0.9}O_3$ at 200-600 ^oC. Reaction conditions: LCCN = 10 mg; F = 20 ml/min, P = 1 atm, yH_2 = 0.1.

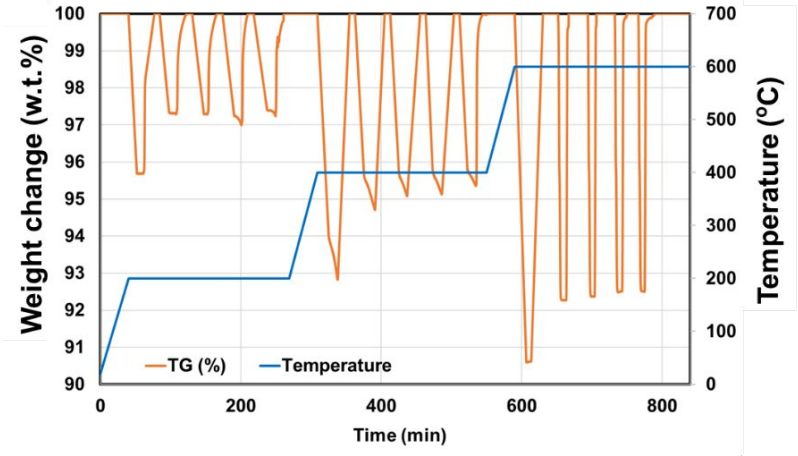
Figure S2. The XRD patterns of the fresh and cycled LCCN after 8 redox cycles.

Figure S3. Oxygen storage capacity (Ro) of different redox system (metal oxide and perovskite)

Table S1. Performance comparisons of the redox catalyst in this study versus the recently published catalysts on methane CLC processes.

Redox catalyst composition	PGM type, content	Optimal reaction temperature (°C)	Reducing atmosphere	Oxygen storage capability (Ro)	Fractional oxidation (X)	Ref
$La_{0.1}Ca_{0.9}Cu_{0.1}Ni_{0.9}O_3$	*N/A*	*400 °C**	*CH_4*	*7.77*	*0.62*	*This work*
$La_{0.9}Sr_{0.1}FeO_3$	N/A	850 °C	CH_4	n/a	0.50	1
R-CM	Rh	600 °C	CH_4	4.1	n/a	
Rh-$CaMn_{0.95}Fe_{0.05}O_3$ R-CMF9505	Rh	600 °C	CH_4	4.5	n/a	
Rh-$CaMn_{0.75}Fe_{0.25}O_3$ R-CMF7525	Rh	600 °C	CH_4	2.8	n/a	2
Rh-$Ca_{0.95}Sr_{0.05}MnO_3$ R-CSM9505	Rh	600 °C	CH_4	2.3	n/a	
Rh-$Ca_{0.75}$ $Sr_{0.25}MnO_3$ R-CSM7525	Rh	600 °C	CH_4	2.9	n/a	
$SrFeO_3$	N/A	400 °C,600 °C, 800 °C	CH_4	0.4, 2.3, 2.1	n/a	3
Rh-$LaCeO_{4-x}$	Rh	650 °C	CH_4	0.4	n/a	4
$La_{0.1}Ca_{0.9}Cu_{0.1}Ni_{0.9}O_3$	*N/A*	*200 °C,400 °C, 600 °C*	*H_2*	*3, 5, 7.8*	*n/a*	*This work*
$Ce_{0.7}Cu_{0.3}O_{2+\delta}$	N/A	700 °C	H_2	3.2	n/a	5
$Ca_2(Al_xMn_{1-x})2O_{5+\delta}$	N/A	700 °C	H_2	3.0	n/a	6
$LuFe_2O_{4+\delta}$	N/A	400 °C	H_2	2.2	n/a	7
$La_{0.5}Sr_{0.5}Co_{0.5}Fe_{0.5}O_{3-\delta}$	N/A	600 °C	H_2	3.6	n/a	8
$Sr_3Fe_2O_{7-\delta}$	N/A	950 °C	H_2	2.0	n/a	9
$BaYMn_2O_{5+\delta}$	N/A	600 °C	H_2	3.7	n/a	10

** the redox catalyst in this study is highly active within this temperature range.*



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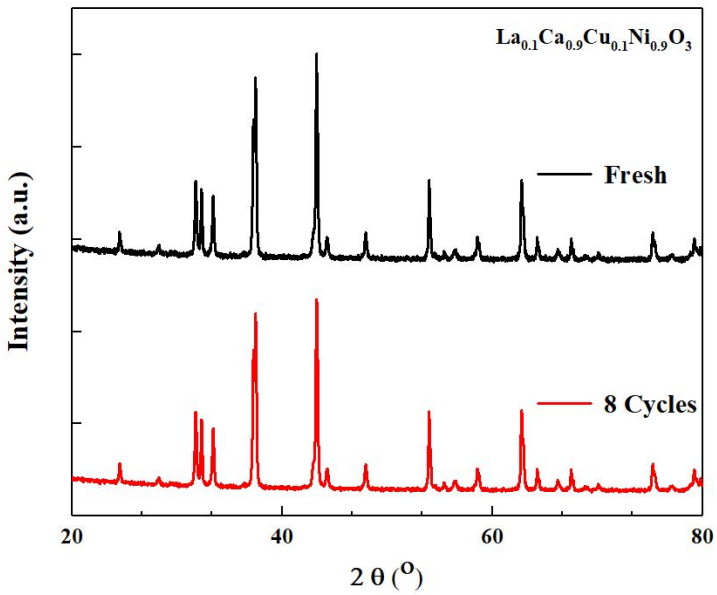

Figure S2. The XRD patterns of the fresh and cycled LCCN after 8 redox cycles.

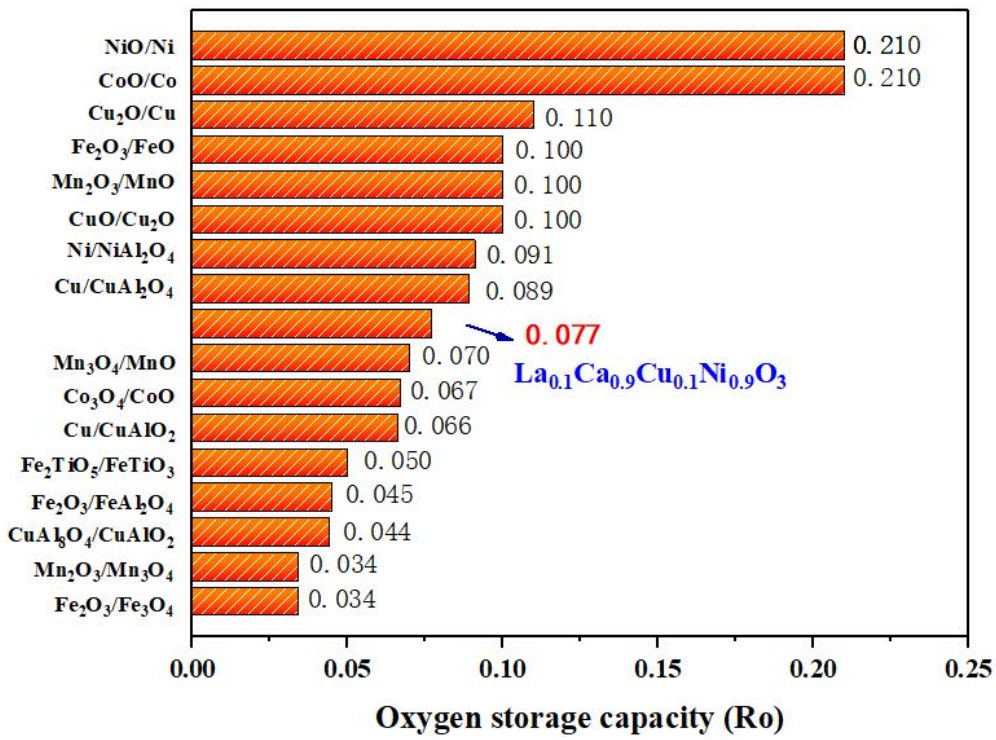

Figure S3. Oxygen storage capacity (Ro) of different redox system (metal oxide and perovskite)[11].

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