Electronic Supplementary Material (ESI) for Reaction Chemistry & Engineering.

Supporting information

Insights into coated NiCrAl open-cell foams for the Catalytic Partial Oxidation of CH_4

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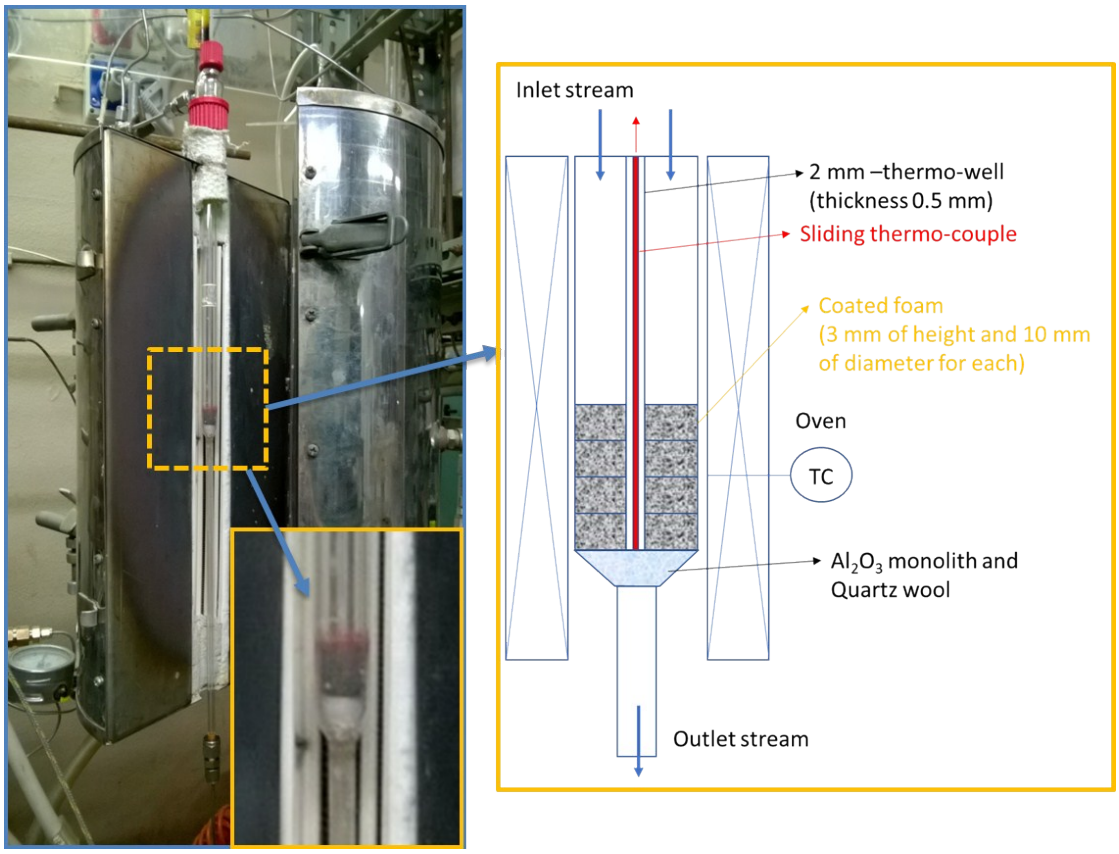

Fig. S1. Reactor layout.

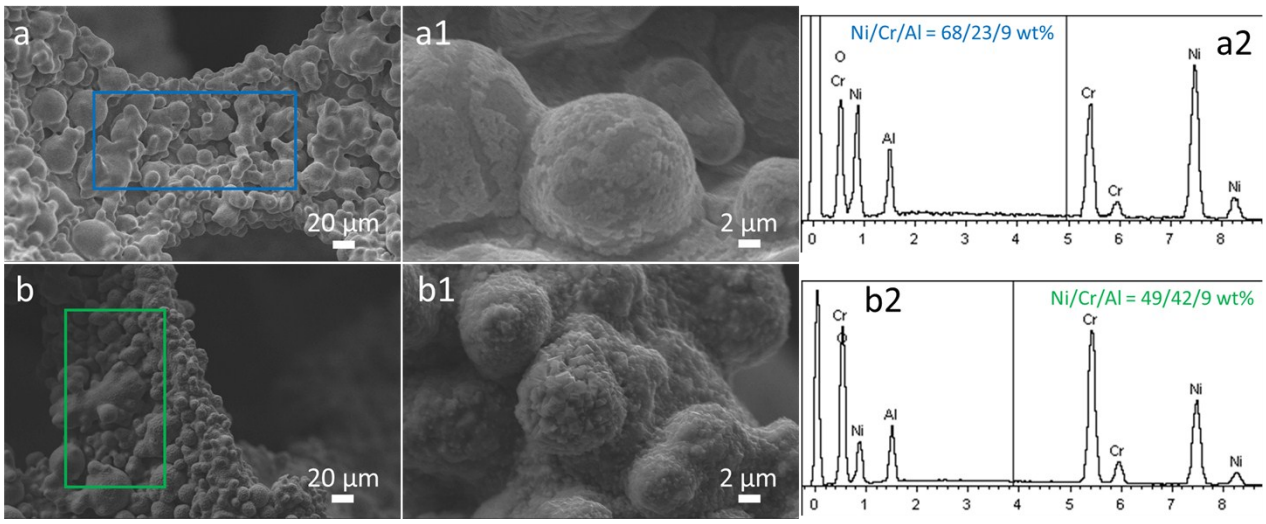

Fig. S2. SEM-EDS characterization of bare NiCrAl foams: clean foam (a, a1, and a2) and calcined foam (b, b1, and b2). Foam surfaces with Cr-enriched composition were observed after calcination in static air at 900 ^{o}C for 12 h, temperature ramp 10 ^{o}C min^{-1}.

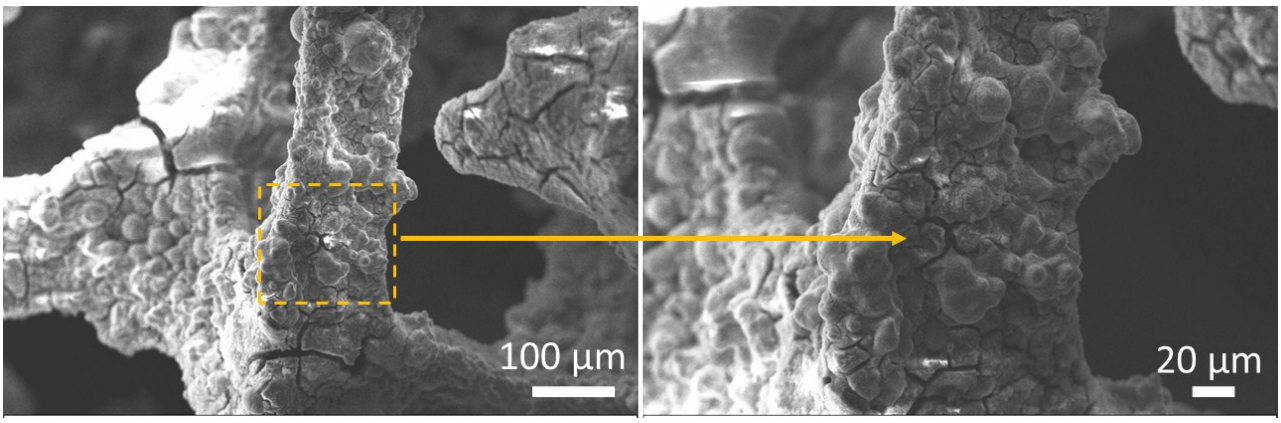

Fig. S3. SEM images of Rh/Mg/Al-HT NiCrAl catalyst coated without pretreatment. Coating is thin, not homogeneous, and it has an Al-rich composition.

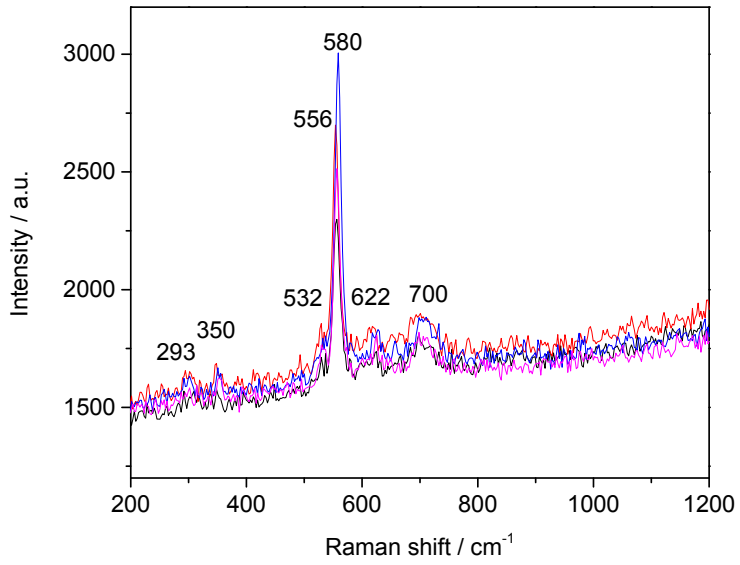

Fig. S4. Raman spectra of bare NiCrAl foam recorded at four different locations. All bands observed were associated to Cr_2O_3.

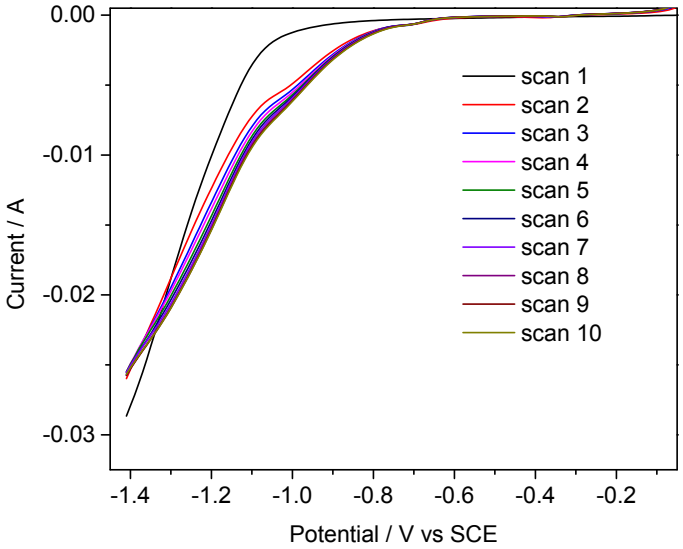

Fig. S5. LSV curves recorded from 0 to -1.4 V *vs SCE* in KNO_3 0.3 M at NiCrAl foam (scan rate 50 mV s^{-1}).

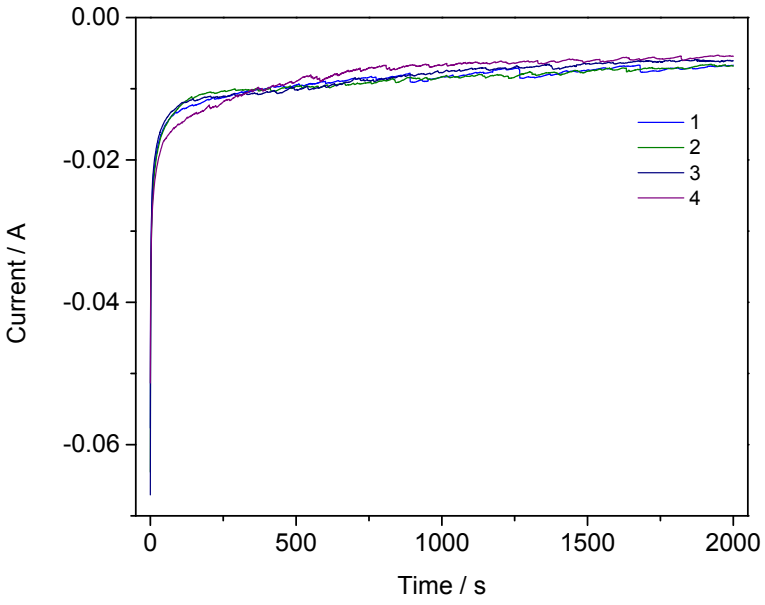

Fig. S6. Typical current transient curves recorded at -1.2 V *vs SCE* for 2000 s during the electrodeposition on 4 samples of NiCrAl foams in 0.06 M nitrate solution containing Rh/Mg/Al = 5/70/25 (a.r.).

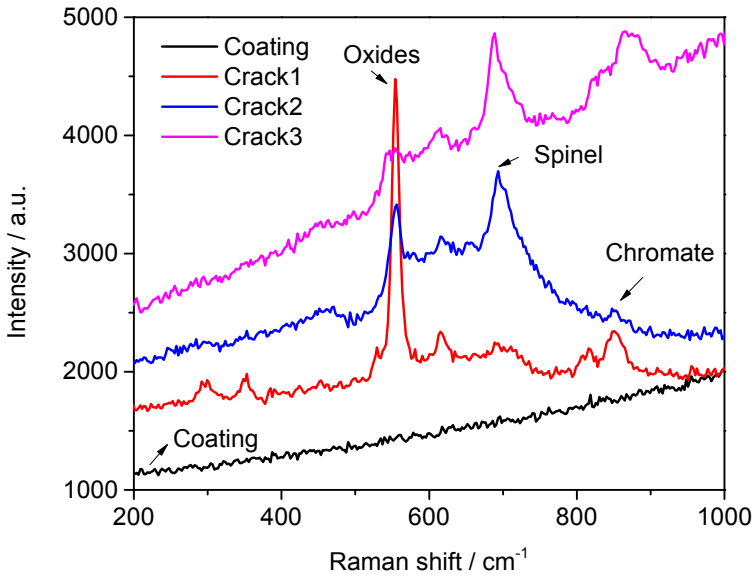

Fig. S7. Raman spectra of calcined coated foam.

Table S1. Selectivities in H_2, CO, and H_2/CO ratio of Rh/Mg/Al-NiCrAl catalyst in CPO of CH_4 at oven temperature 750 ^oC in different reaction conditions. Average values of four analyses in each reaction conditions were displayed

Foam number	$CH_4/O_2/N_2$ / v/v	GHSV / h^{-1}	Rh/Mg/Al-NiCrAl		
			Sel. H_2 / %	Sel. CO / %	H_2/CO
4	2/1/20	126,000	79.4 ± 1.9	89.3 ± 0.5	1.78 ± 0.04
		77,400	81.0 ± 2.1	91.1 ± 0.3	1.78 ± 0.04
		30,500	84.8 ± 1.8	96.7 ± 0.3	1.75 ± 0.03
	2/1/4	30,500	79.1 ± 2.7	91.1 ± 1.9	1.74 ± 0.02
		23,000	78.1 ± 2.8	89.1 ± 2.7	1.75 ± 0.01
2	2/1/20	252,000	71.6 ± 0.9	82.9 ± 0.4	1.73 ± 0.01
		154,800	75.5 ± 0.4	86.9 ± 0.5	1.74 ± 0.01
		61,000	82.5 ± 0.9	94.9 ± 0.3	1.74 ± 0.02
	2/1/4	61,000	76.8 ± 0.2	89.9 ± 0.6	1.71 ± 0.01
		46,000	75.8 ± 0.5	87.3 ± 0.8	1.74 ± 0.01

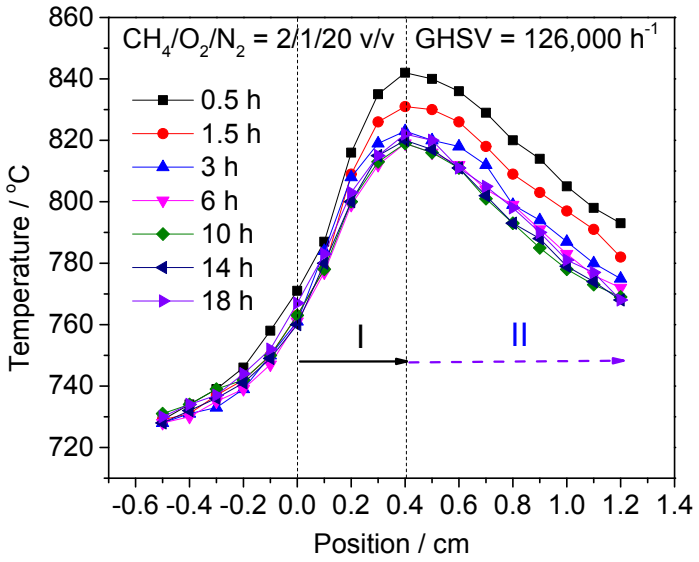

Fig. S8. Temperature profiles measured at GHSV = 126,000 h^{-1} in diluted gas mixture at different points of time-on-stream. The hot spot temperatures decreased at the beginning of the test when the catalyst was further activated by time-on-stream and reached to stability after 3 h of time-on-stream.

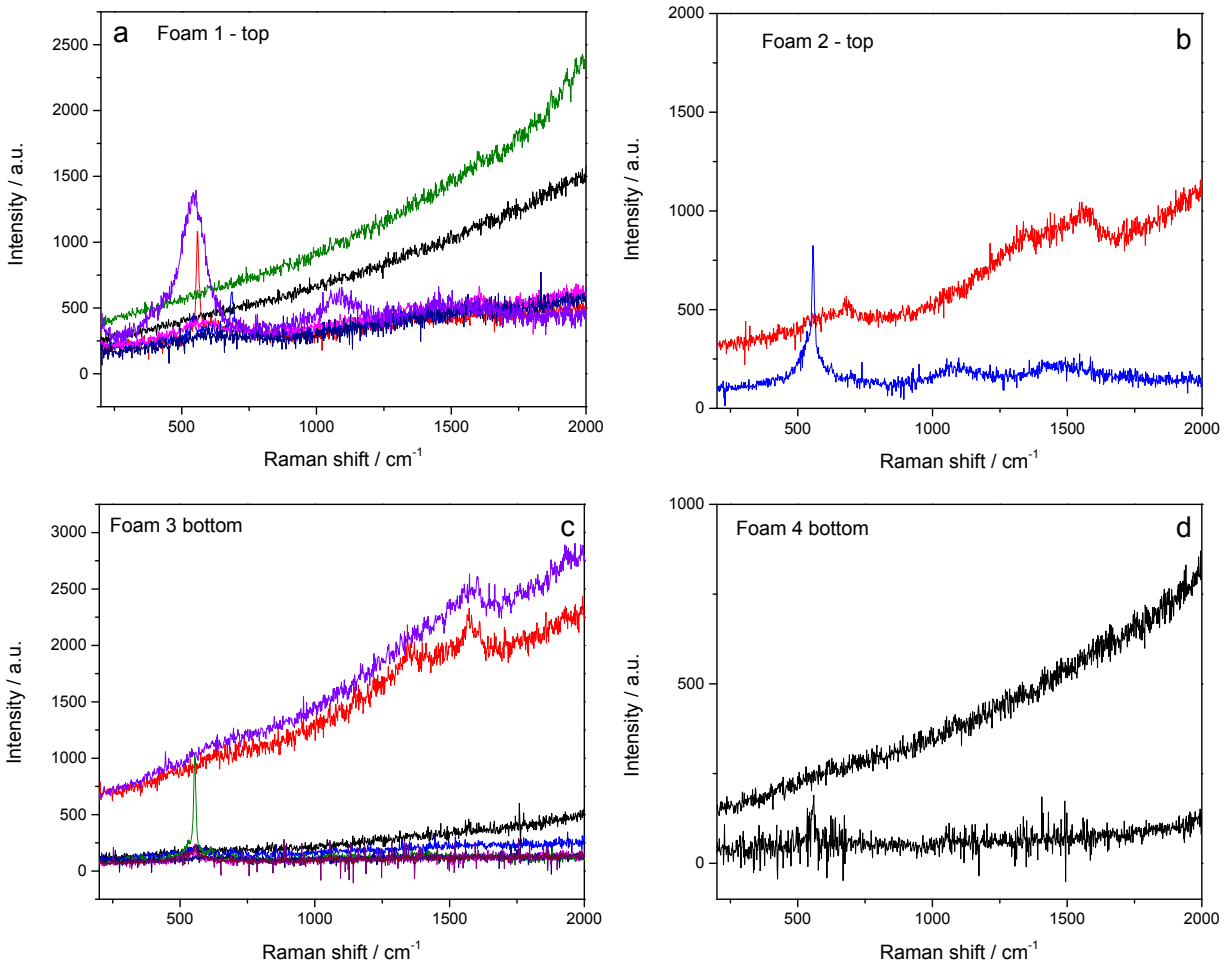

Fig. S9. Raman spectra of the spent catalysts tested in the four-foam catalytic bed configuration.