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

Supplementary materials

The effect of rhenium in the conversion of glycerol to mono-alcohols over nickel catalysts under continuous flow conditions

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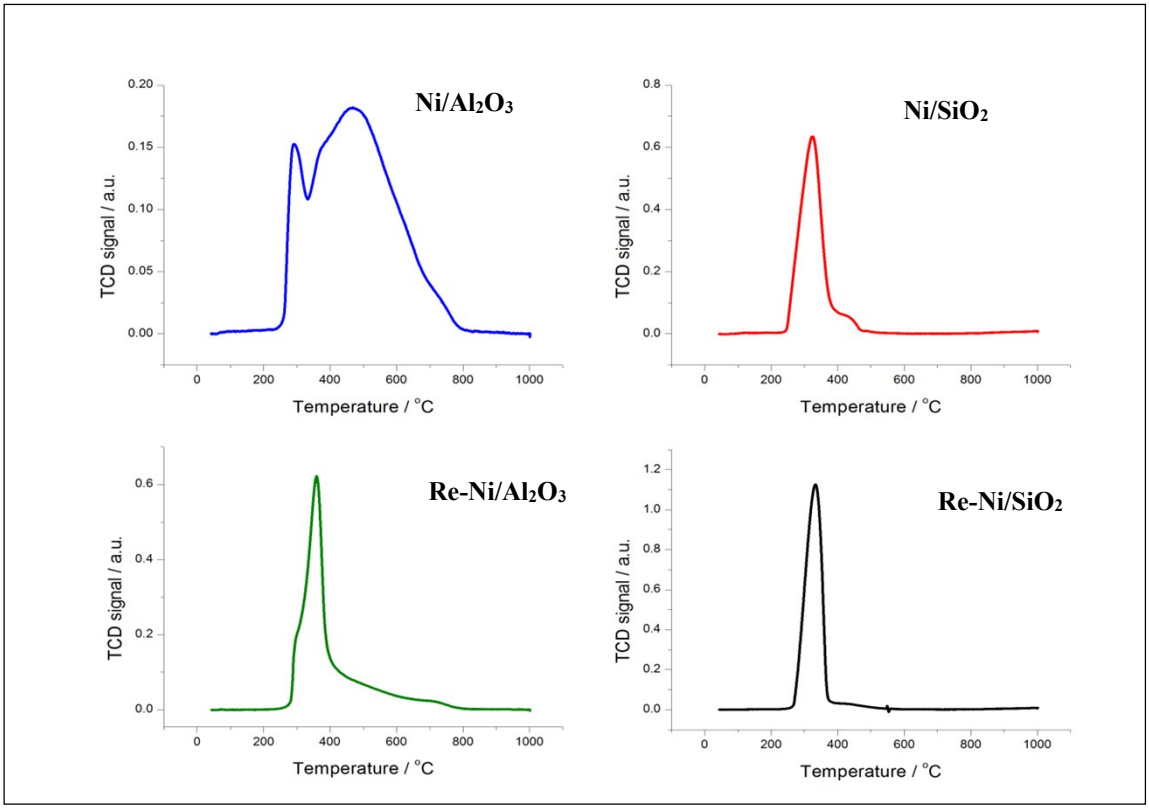


Figure S1 TPR profiles of the Ni catalysts.

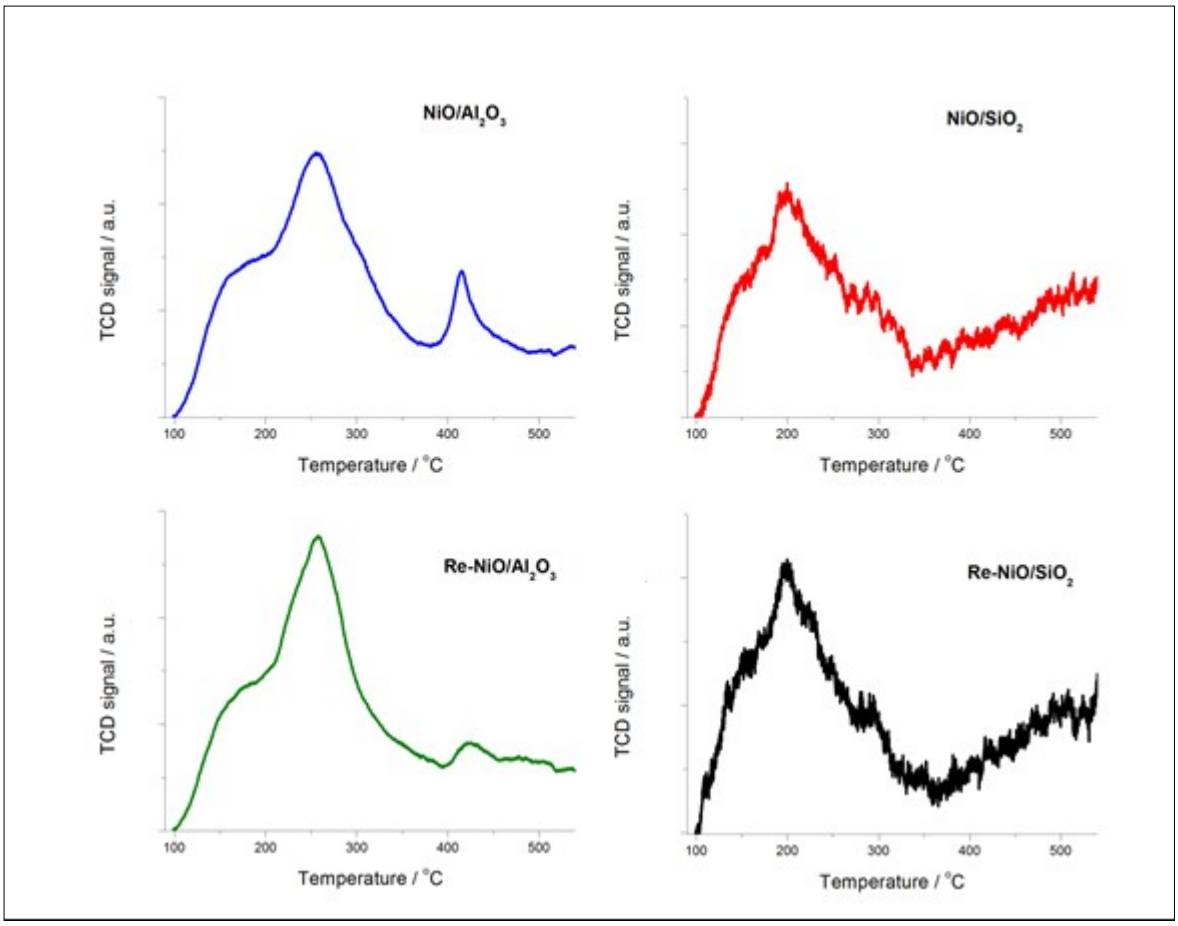
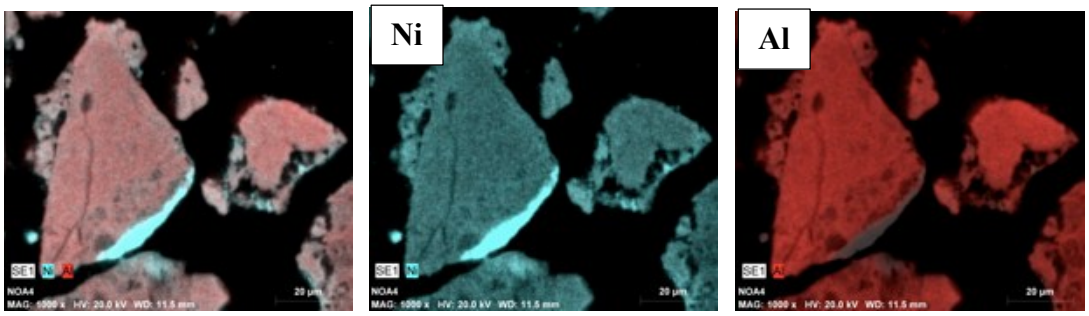
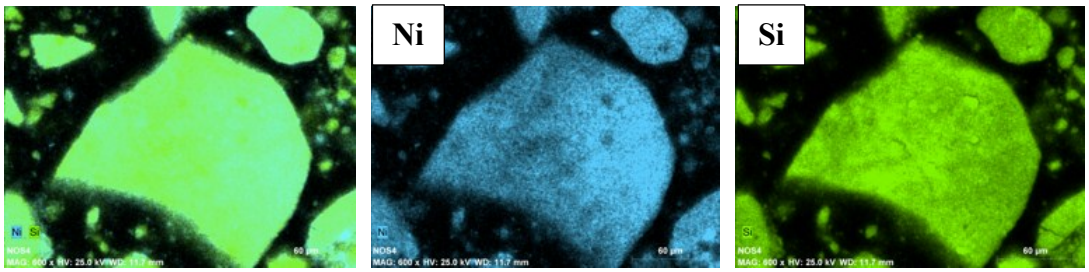


Figure S2 TPD profiles of the Ni catalysts.

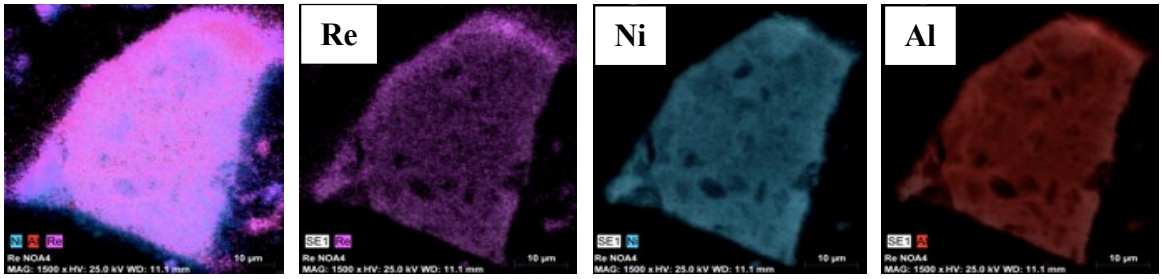
(a) Ni/Al_2O_3



(b) Ni/SiO_2



(c) $Re\text{-}Ni/Al_2O_3$



(d) $Re\text{-}Ni/SiO_2$

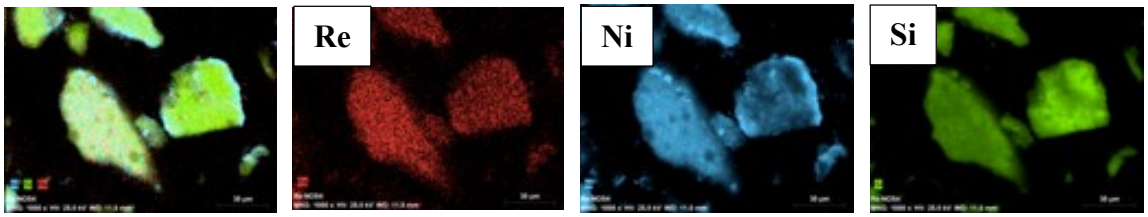


Figure S3 SEM-EDS images of (a) Ni/Al_2O_3, (b) Ni/SiO_2, (c) $Re\text{-}Ni/Al_2O_3$ and (d) $Re\text{-}Ni/SiO_2$.

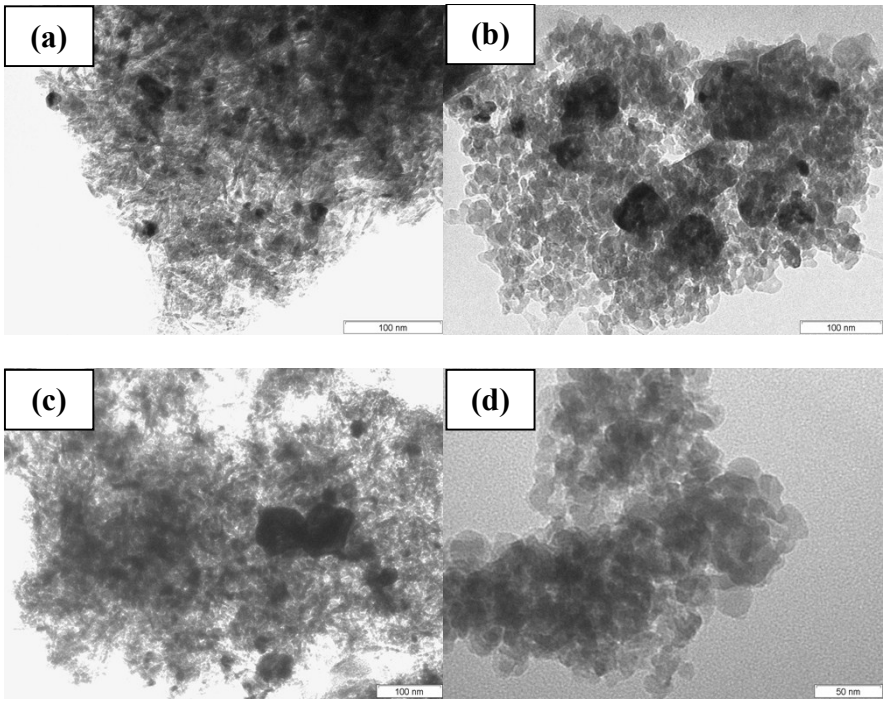


Figure S4 TEM images of (a) Ni/Al_2O_3, (b) Ni/SiO_2, (c) $Re\text{-}Ni/Al_2O_3$ and (d) $Re\text{-}Ni/SiO_2$.

Hydrogen chemisorption

The crystallite size was calculated as follows:

$$d_p = \frac{F_g}{\rho \times MSA_m} \times \frac{m^3}{10^6 cm^3} \times \frac{10^9 nm}{m}$$

where:

F_g **= crystallite geometry factor**

ρ **= specific gravity of the active metal, g/cm^3**

MSA_m **= active metal surface area per gram of metal, m^2/g$_{metal}$**

Table S1 Selectivity to products over Ni/Al_2O_3

	Selectivity / mol%			
	250 °C	**275 °C**	**300 °C**	**325 °C**
methanol	2.3	4.4	9.7	15.6
ethanol	9.3	13.7	19.2	24.4
2-propanol	0.1	0.2	1.5	8.3
1-propanol	0.4	0.9	3.4	10.2
ethylene glycol	13.5	10.1	9.8	8.7
1,2-propanediol	68.9	62.5	39.8	16.1
1,3-propanediol	0.0	0.4	2.4	2.8
others[a]	5.5	7.8	14.0	13.6

[a] Others = methane, ethane, propane, CO, CO_2, acetol, condensation products

Table S2 Selectivity to products over Ni/SiO_2

	Selectivity / mol%			
	250 °C	**275 °C**	**300 °C**	**325 °C**
methanol	7.2	9.3	19.9	25.6
ethanol	7.1	13.8	18.8	19.9
2-propanol	1.4	3.4	4.9	5.4
1-propanol	2.1	5.0	7.3	9.7
ethylene glycol	25.7	11.8	8.0	2.2
1,2-propanediol	54.5	53.2	33.8	23.3
1,3-propanediol	0.3	0.5	0.8	1.4
others[a]	1.7	3.0	6.5	12.5

[a] Others = methane, ethane, propane, CO, CO_2, acetol, condensation products

Table S3 Selectivity to products over Re-Ni/Al_2O_3

	Selectivity / mol%			
	250 °C	**275 °C**	**300 °C**	**325 °C**
methanol	2.5	3.2	8.0	13.6
ethanol	7.7	10.8	14.5	17.7
2-propanol	0.8	1.3	3.1	6.4
1-propanol	2.3	4.9	12.7	29.4
ethylene glycol	9.5	7.8	2.6	1.8
1,2-propanediol	70.4	62.1	47.4	15.9
1,3-propanediol	0.1	1.1	2.6	3.7
others[a]	6.7	8.8	9.1	11.5

[a] Others = methane, ethane, propane, CO, CO_2, acetol, condensation products

Table S4 Selectivity to products over Re-Ni/SiO_2

	Selectivity / mol%			
	250 °C	**275 °C**	**300 °C**	**325 °C**
methanol	1.8	4.3	9.4	22.9
ethanol	9.1	14.5	18.6	19.5
2-propanol	0.3	1.1	3.6	4.4
1-propanol	1.7	4.7	16.1	24.5
ethylene glycol	10.0	5.3	2.3	1.2
1,2-propanediol	75.8	64.8	38.4	14.3
1,3-propanediol	0.1	0.8	2.4	2.9
others[a]	1.2	4.5	9.2	10.3

[a] Others = methane, ethane, propane, CO, CO_2, acetol, condensation products