Electronic Supplementary Information

Number and intrinsic activity of cobalt surface sites in platinum promoted zeolite catalysts for carbon monoxide hydrogenation

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Determination of Turnover Frequency of SSITKA (TOF_{SSITKA}):

$$TOF_{SSITKA} = \frac{Fractional\ coverage}{Surface\ residence\ time\ of\ CHx} \qquad Eq.1$$

$$Fractional\ coverage = \frac{Number\ of\ CHx\ sites}{Total\ number\ of\ active\ sites} \qquad Eq.2$$

Determination of the number of adsorbed species (N_{CO} and N_{CHx}) :

The amount of adsorbed species was calculated from SSITKA using the formula described by Efstathiou[1] and Dijk[2]:

$$N_{CO}\left(\frac{mol}{g}\right) = \frac{F_{CO}}{W_{cat}}\left(\int_0^{\infty}[nCO(t) - nNe(t)]dt\right) \qquad Eq.\ 3$$

Where F_{CO} : carbon monoxide outlet molar flowrate in mol/s

W_{cat} : catalyst loading in g

$nCO(t)$ and $Ne(t)$: CO and Ne normalized MS data obtained during SSITKA switches.

In order to correct the chromatographic effect, the following formula applied by Biloen et al.[3] was applied to determine the number of intermediates:

$$N_{CHx}\left(\frac{mol}{g}\right) = \frac{F_{CH4}}{W_{cat}}\left(\int_0^{\infty}[nCH4(t) - 0.5(nCO(t) - nNe(t))]dt\right) \qquad Eq.\,4$$

Where F_{CH4}: CH_4 outlet molar flowrate in mol/s

$nCH4(t)$: normalized MS data obtained during SSITKA for CH_4

[1] Kalamaras, C.M.; Gonzalez, I.D.; Navarro, R.M.; Jose Luis G. Fierro, J.L.G.; Efstathiou, A.M. *J.Phys.Chem C* **2011**, *115*, 11595–11610.

[2] Van Dijk, H.A.J.; Hoebink, J.H.B.J.; Schouten, J.C. *Chem. Eng. Sci.* **2011**, *56*, 1211-1219.

[3] Biloen, P.; J. N. Helle, F; G. A. van den Berg; Sachtler, W.M.H. *J. Catal*. **1983**, *81*, 450-463.

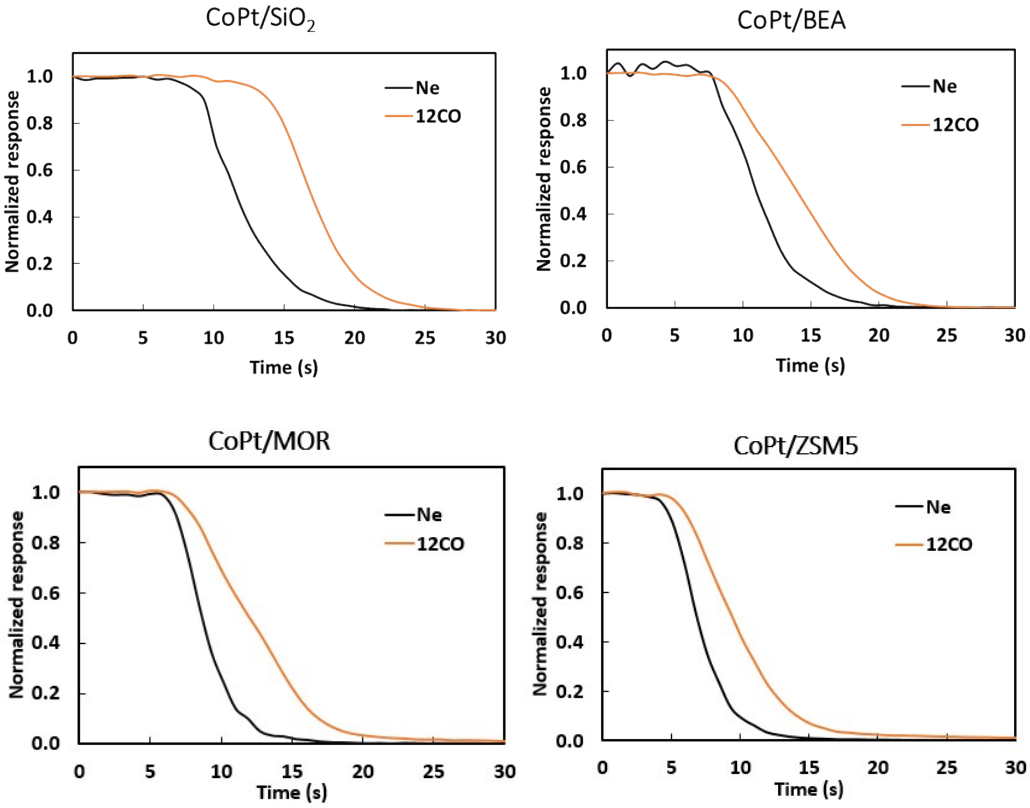
CoPt/SiO2
CoPt/BEA
CoPt/MOR
CoPt/ZSM5
Normalized response
Time (s)
Ne
12CO
0.0
0.2
0.4
0.6
0.8
1.0
0
5
10
15
20
25
30

Figure S1. Transient curves of CO and inert (Ne) during CO adsorption at 100 °C over cobalt catalysts supported on SiO_2, BEA, MOR and ZSM-5. Experimental error in the number of active sites equal to 6%.

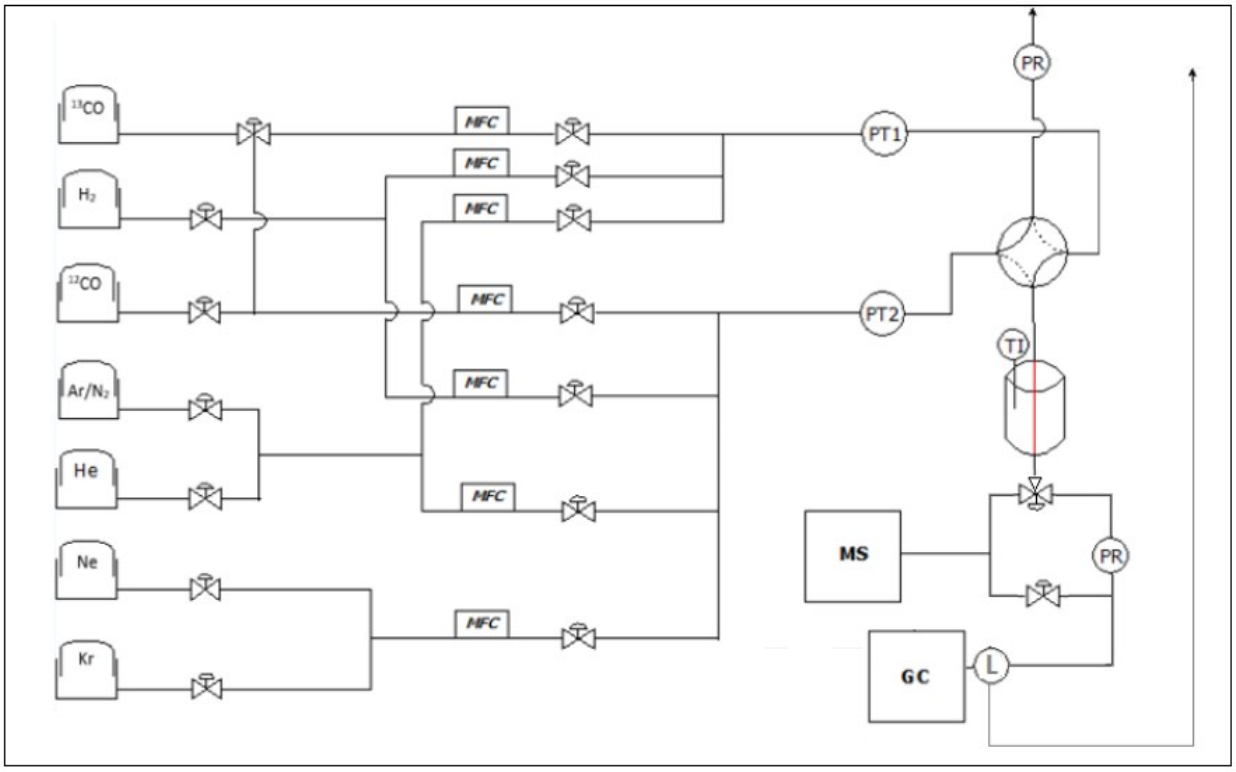

Figure S2. Schematic representation of the SSITKA setup. (MFC = flow controller; PT = pressure transducer; PR = pressure regulator ; TI = temperature indicator; MS = mass spectrometer; GC = gas chromatograph; L = GC loop).