Communication

Highly Dispersed Co Nanoparticles Prepared by an Improved Method for Plasma-Driven NH_3 Decomposition to Produce H_2

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1. Co loading analysis of fumed SiO_2 supported Co catalysts with different preparation methods, Table S1 and Table S2.

The theoretical Co content was 30 wt%, and the actual loading was expected to be similar with the theoretical loading because the incipient-wetness impregnation was employed to prepare fumed SiO_2 supported Co catalysts in this study. In addition, the actual loading of catalyst was measured using X-ray fluorescence (XRF, SRS-3400, Bruker, Germany) as following Table S1 and S2. Through calculating CoO to Co, 27.7 wt.% and 27.4 wt.% was achieved for Co/fumed SiO_2 prepared with "improved" and "conventional" methods, respectively.

Table S1. XRF analysis of Co/fumed SiO_2 with improved preparation method

SiO_2	CoO	Fe_2O_3	CaO	Cl	Compton	Rayleigh	Norm.
22.2 KCps	117.1 KCps	0.6 KCps	0.1 KCps	0.1 KCps			
64.5%	35.2%	0.241%	0.0527%	0.0493%	0.77	1.08	100.00%

Table S2. XRF analysis of Co/fumed SiO_2 with conventional preparation method

SiO_2	CoO	Fe_2O_3	CaO	Cl	Compton	Rayleigh	Norm.
20.8 KCps	109.2 KCps	0.3 KCps	0.2 KCps	0.1 KCps			
64.7%	34.9%	0.259%	0.0659%	0.0625%	0.68	1.01	100.00%

2. Analysis of each peak area of the H_2-TPR profiles obtained using peak fit function (Gaussian) of Origin software, Figure S1.

The area ratio of β_1/β_2 was found to be 1/3, which is quantitatively consistent with the theoretical value (1/3) of area ratio of Co_3O_4 reduction peaks as shown in Eq (1) and Eq (2). This indicates that β_1 and β_2 was the two-step reduction of $Co^{3+} \rightarrow Co^{2+} \rightarrow Co^0$ of Co_3O_4, so does for the case of α_1 and α_2 based on 5/16 ($\approx$ 1/3) area ratio of α_1/α_2.

$Co_3O_4 + H_2 \rightarrow 3CoO + H_2O$ (1)

$3CoO + 3H_2 \rightarrow 3Co + 3H_2O$ (2)

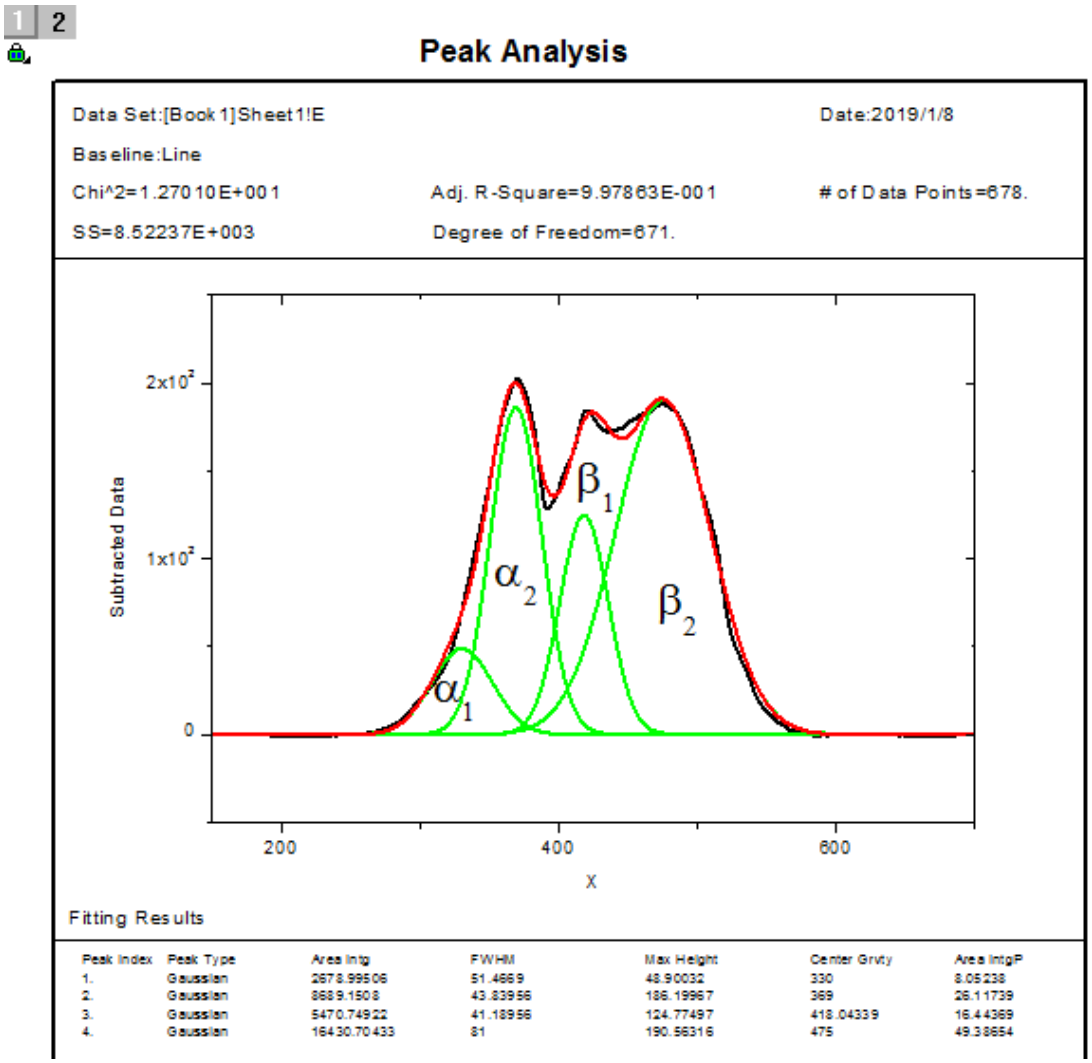

Figure S1. Peak analysis of H_2-TPR profile obtained over Co_3O_4/fumed SiO_2 catalyst.