

## Supplementary information

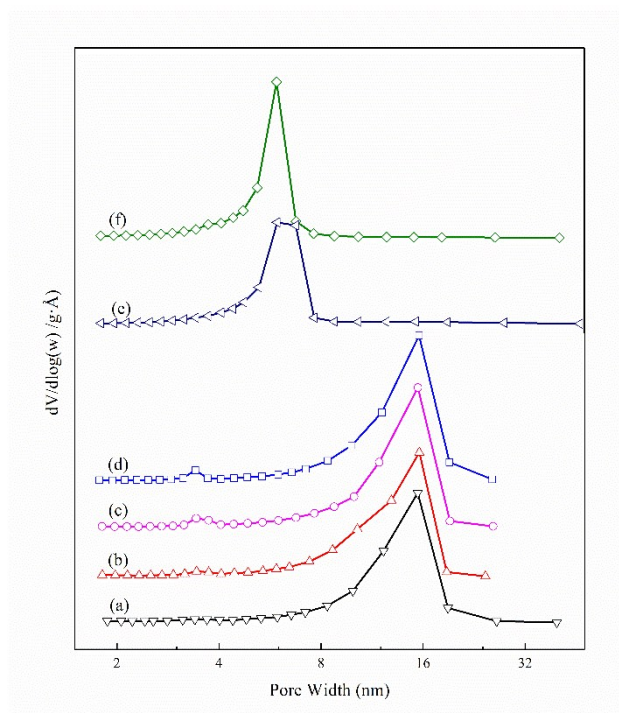


Fig. S1. The pore size distributions of silica and fresh catalysts: (a) Co-Si, (b) Co-0.1GSi, (c) Co-0.5GSi, (d) Co-1.0GSi, (e) 0.5GSi, and (f) SiO<sub>2</sub>.

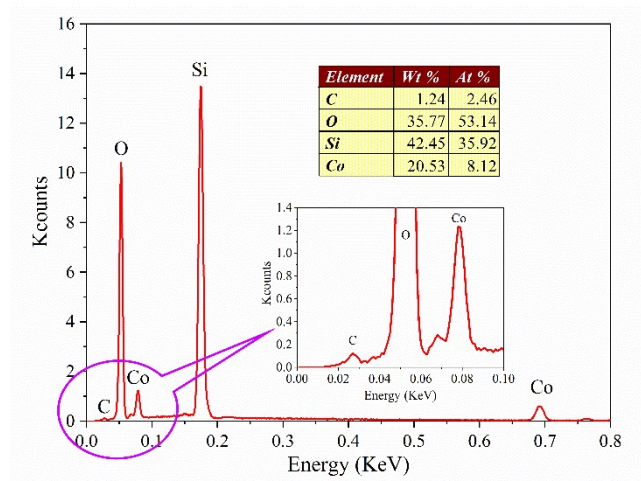


Fig. S2. EDS spectra of calcined Co-1.0GSi catalyst

Table S1 the temperature and H<sub>2</sub> consumption of the decomposed TPR profiles, with the assumption that the H<sub>2</sub> consumption of  $\alpha$  peak is in the proportions of 25%.

Catalyst	Temperature (°C) / Peak area (%)			H <sub>2</sub> consumption (mmol/g)
	$\alpha$	$\beta$	$\gamma$	
Co-Si	335 / 25	376 / 19	410 / 56	3.934
Co-0.1GSi	334 / 25	372 / 25	398 / 50	4.049
Co-0.5GSi	326 / 25	370 / 38	404 / 37	4.157
Co-1.0GSi	326 / 25	368 / 42	390 / 33	4.397

Table S2 Energy of the calcined catalysts and atomic ratio of Co/Si on the catalyst surface.

Sample	Co 2p <sub>3/2</sub> (eV)			Spin-orbital Splitting (eV)	Co 2p <sub>1/2</sub> (eV)			Co/Si (Atomic ratio %)
	Co <sup>3+</sup>	Co <sup>2+</sup>	Satellite		Co <sup>3+</sup>	Co <sup>2+</sup>	Satellite	
Co-Si	779.8	781.5	788.3	15.0	794.8	796.8	803.3	6.7
Co-1.0GSi	779.9	781.6	788.4	15.1	795.0	797.0	803.5	8.3