Supplementary material

Effects of CO_2 to deactivation behaviors of Co/Al_2O_3 and Co/SiO_2 for CO hydrogenation to hydrocarbons

Kyung Soo Park, K. Saravanan, Seon-Ju Park, Yun-Jo Lee, Ki-Won Jeon, Jong Wook Bae*

Figure S8. Cobalt particle size distributions from the TEM images of (A) Co/γ-Al_2O_3, (B) Co/SiO_2: (1) reduced catalyst, (2) used catalyst without CO_2 addition and (3) used catalyst with CO_2 addition

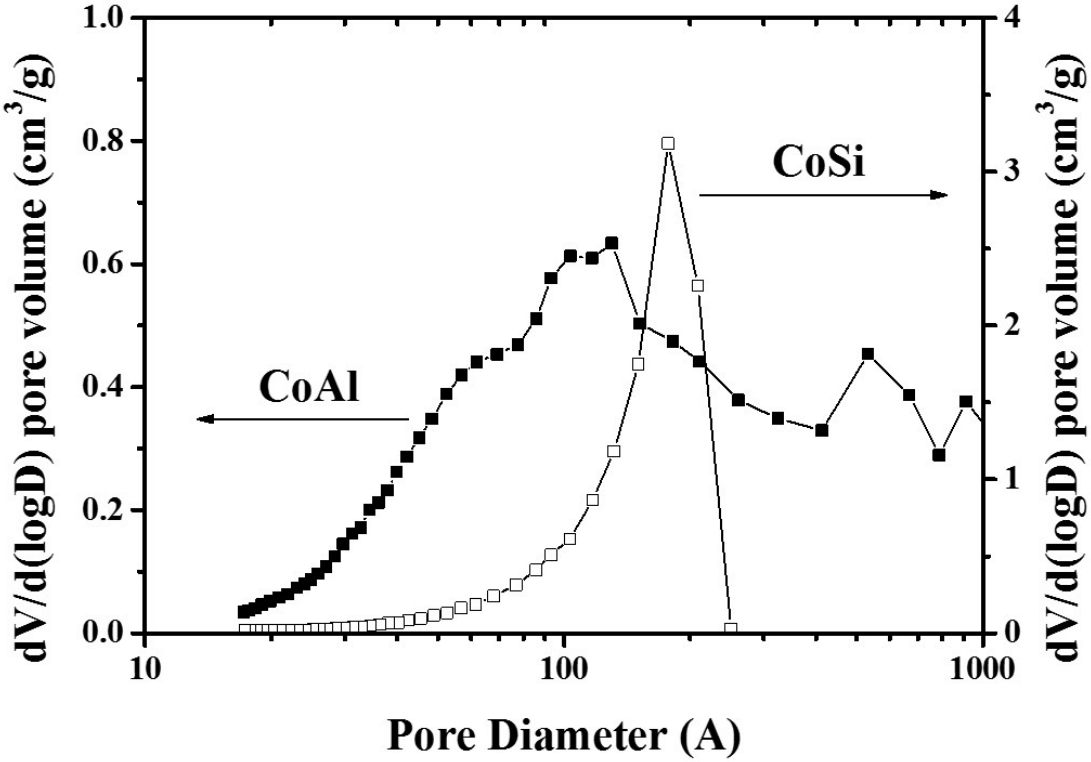

Figure S1. Pore size distribution of the fresh Co/γ-Al_2O_3 and Co/SiO_2 catalysts

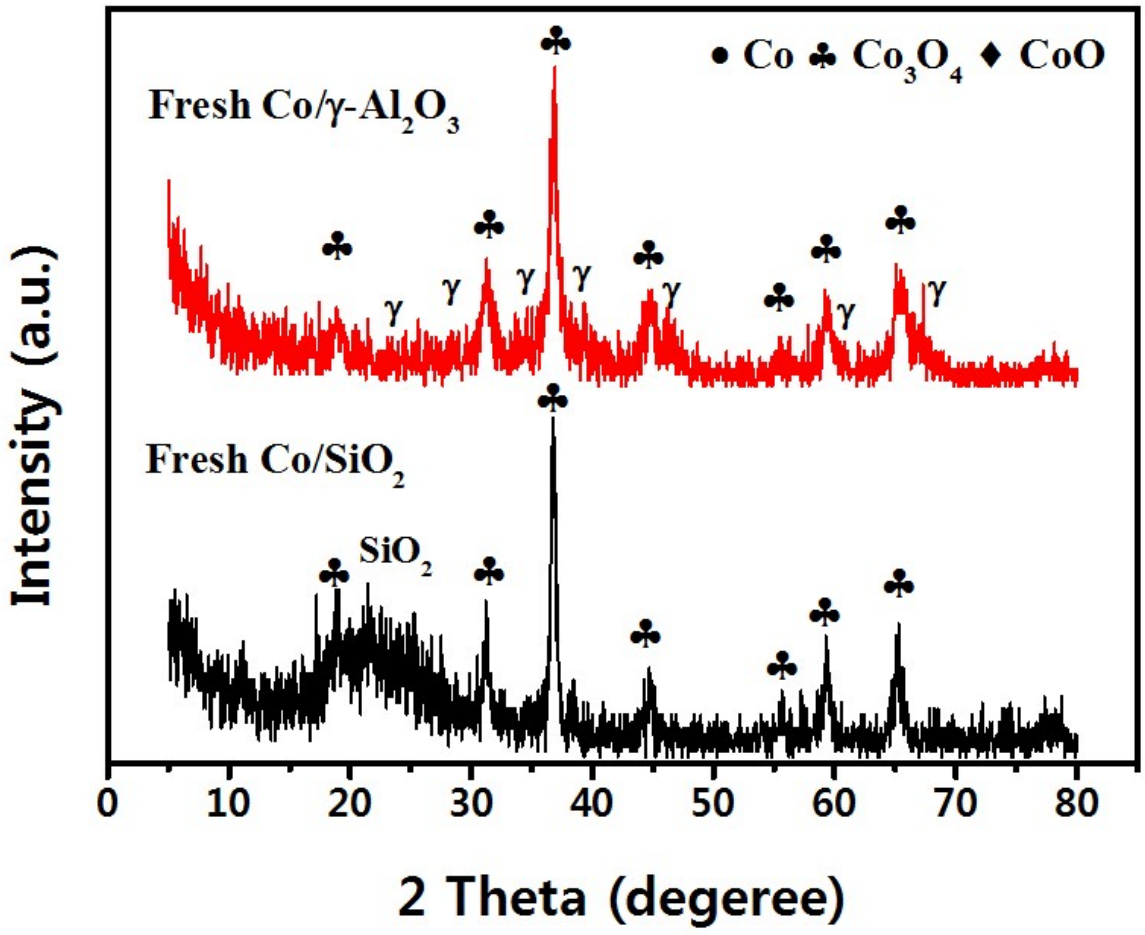

Figure S2. PXRD patterns of the fresh Co/γ-Al_2O_3 [from **ref. 8**] and Co/SiO_2 catalysts

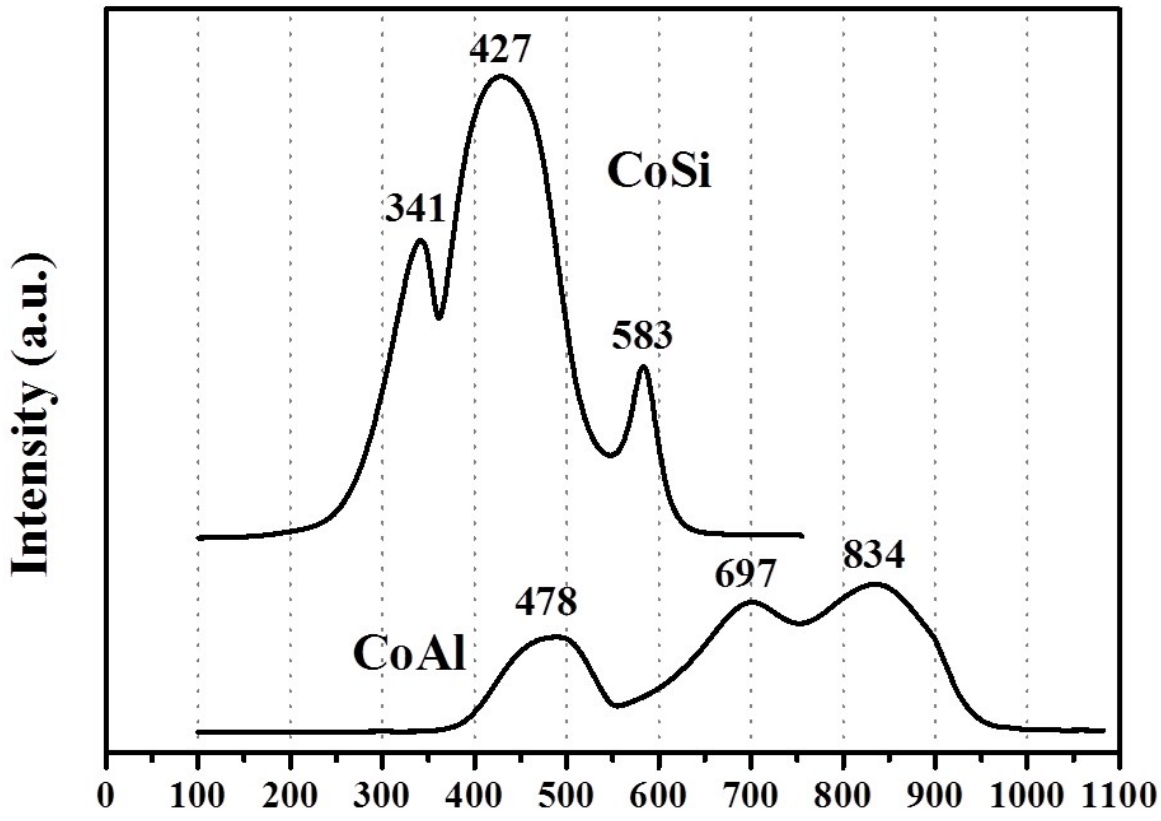

Figure S3. H_2-TPR profiles of the fresh Co/γ-Al_2O_3 and Co/SiO_2 catalysts at a heating rate of 5 °C/min from 100 to 1100 °C

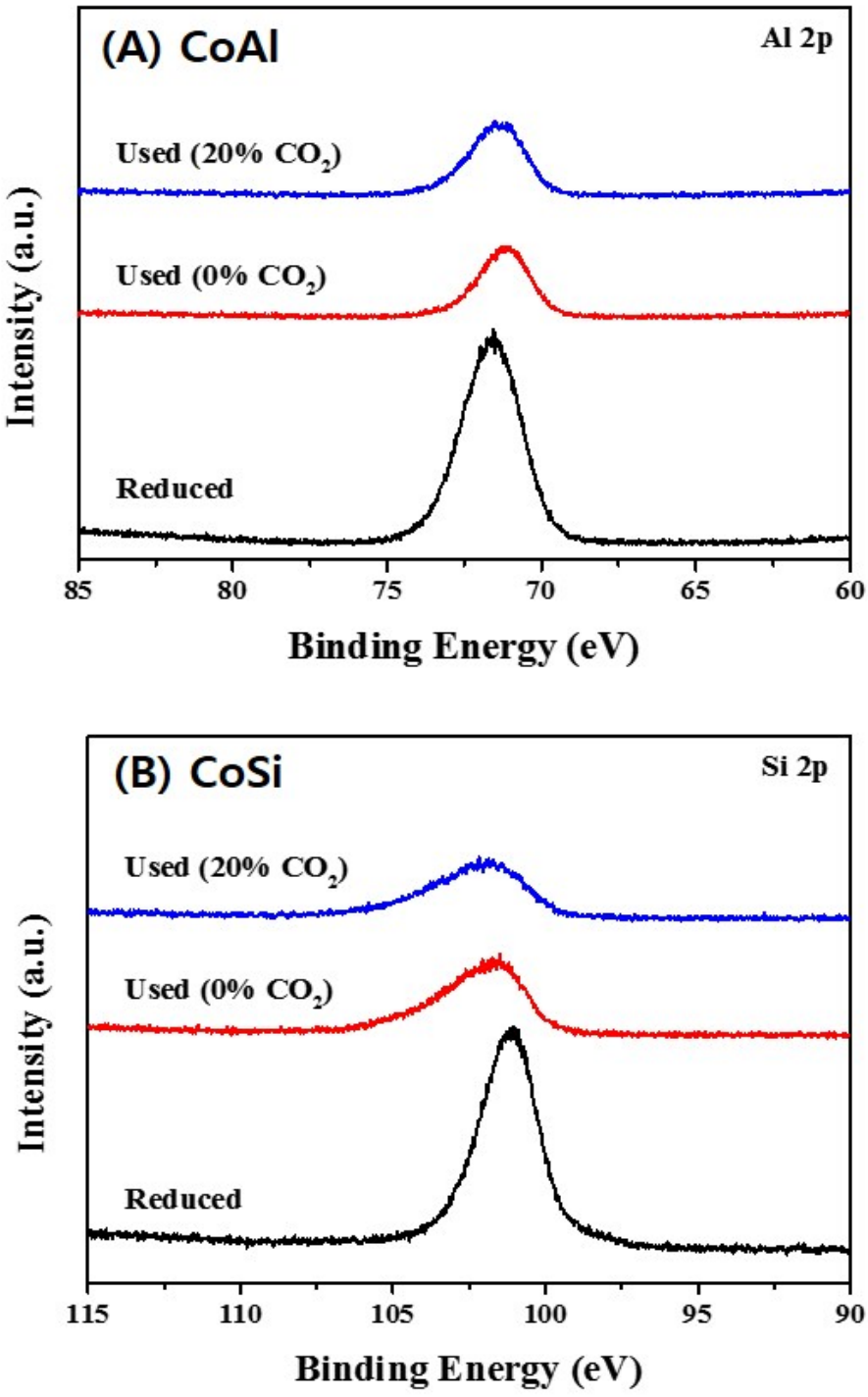

Figure S4. XPS analysis of (A) Al 2p of the Co/γ-Al_2O_3 and (B) Si 2p of the Co/SiO_2 on the fresh (only reduction), used catalysts after FTS reaction without CO_2 addition and used catalysts after FTS reaction with 20%CO_2 addition

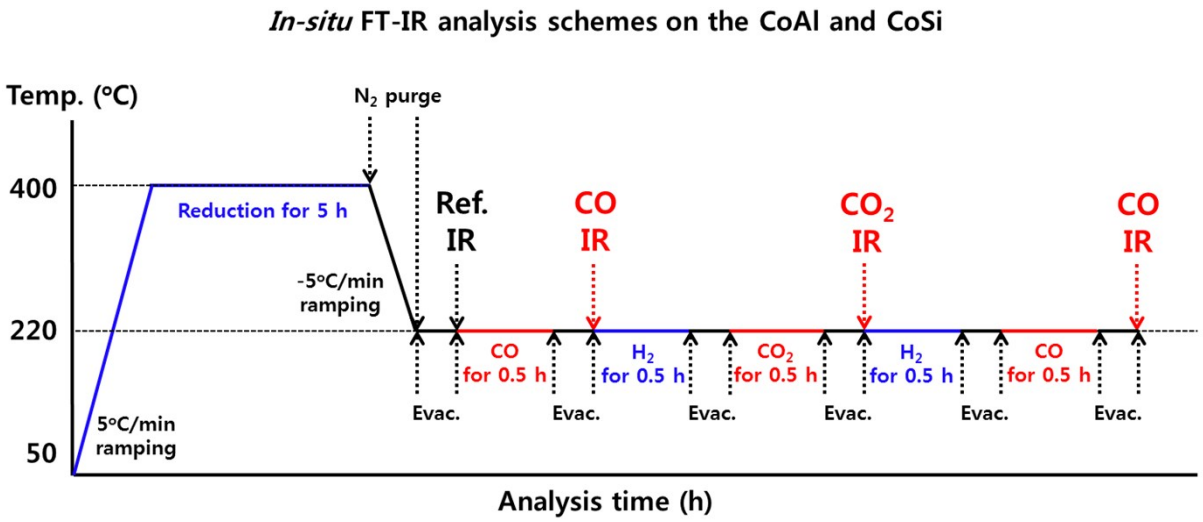

Figure S5. Schemes of FT-IR analyses for the successive adsorption of CO → CO_2 → CO on the reduced CoAl and CoSi after H_2 purge at each step to verify the oxidation-reduction properties of the supported cobalt nanoparticles

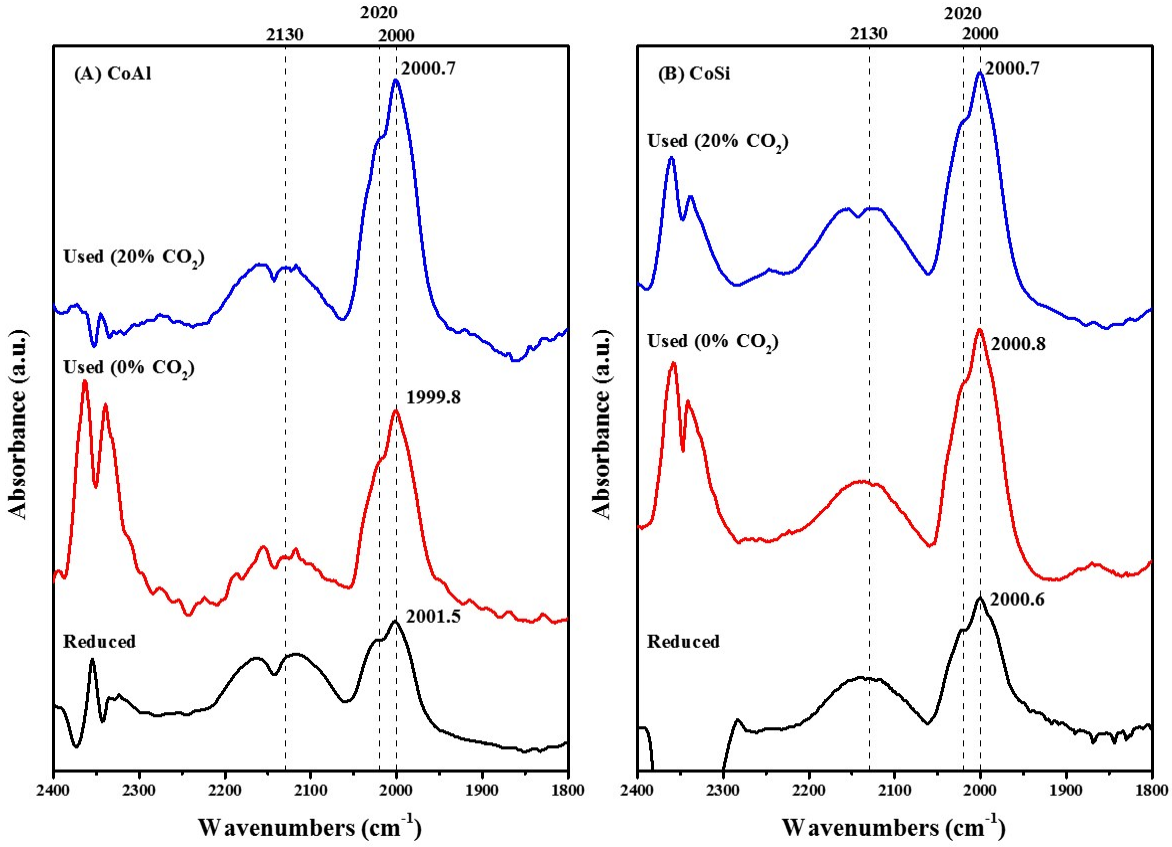

Figure S6. FT-IR analysis of adsorbed CO molecules on the (A) Co/γ-Al_2O_3 catalyst and (B) Co/SiO_2 catalyst for the fresh catalyst, used catalyst without CO_2 addition and used catalyst with CO_2 addition

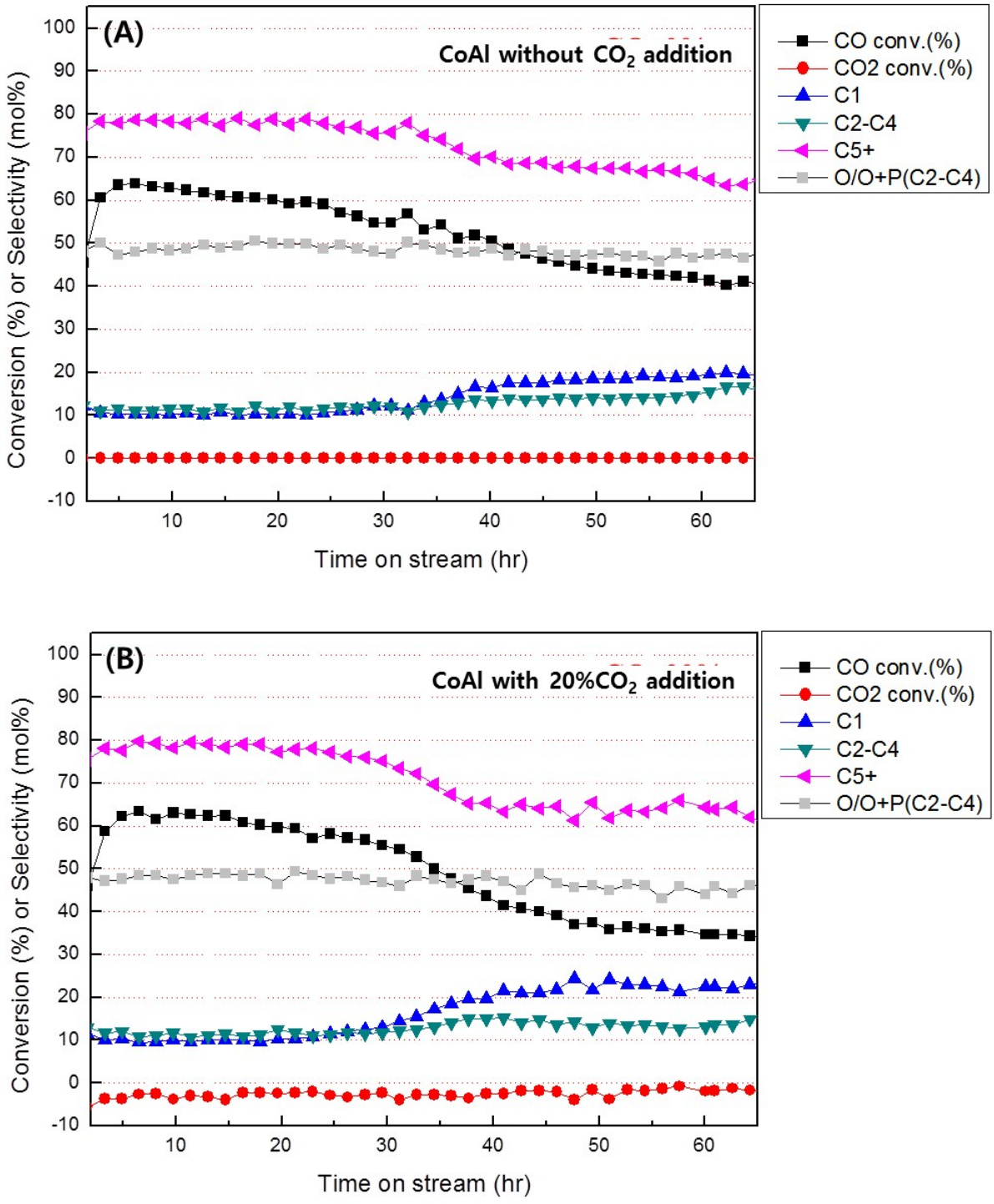

Figure S7. CO conversion and product distribution with time one stream on the (A) Co/γ-Al_2O_3 without CO_2 addition, (B) Co/γ-Al_2O_3 with 20vol%CO_2 addition, (C) Co/SiO_2 without CO_2 addition and (D) Co/SiO_2 with 20vol%CO_2 addition

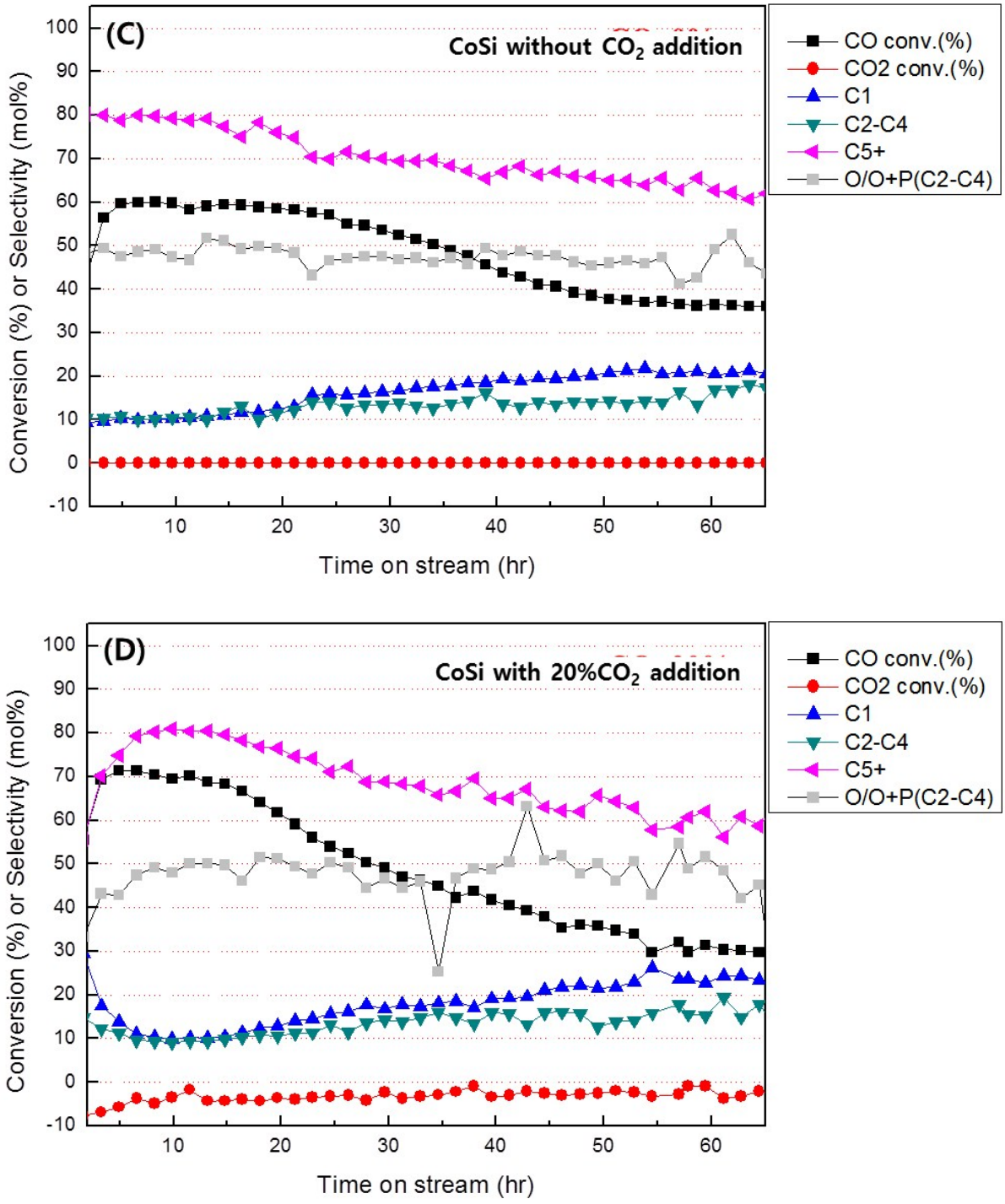

Figure S7. CO conversion and product distribution with time one stream on the (A) Co/γ-Al_2O_3 without CO_2 addition, (B) Co/γ-Al_2O_3 with 20vol%CO_2 addition, (C) Co/SiO_2 without CO_2 addition and (D) Co/SiO_2 with 20vol%CO_2 addition (continued)

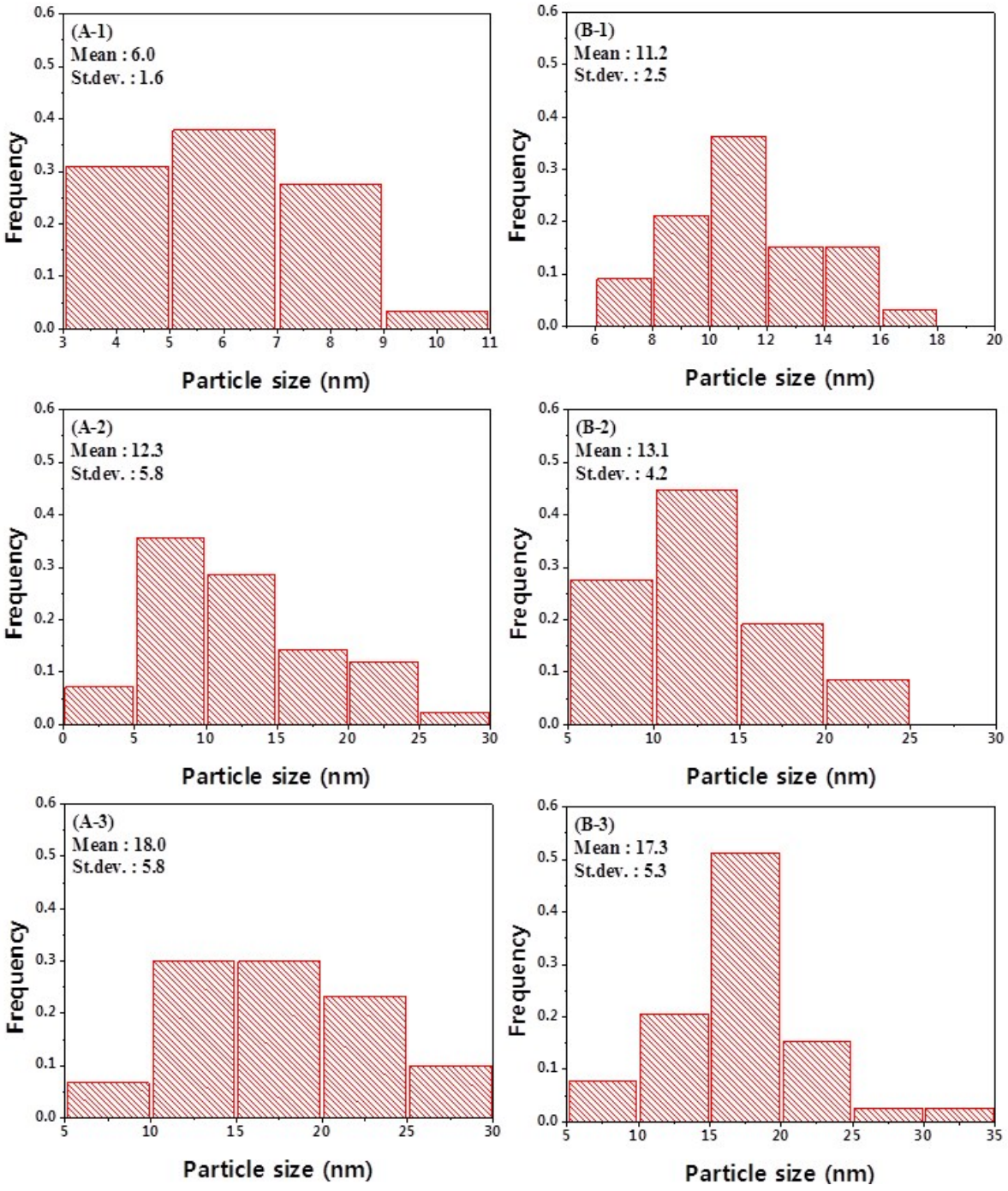

Figure S8. Cobalt particle size distributions from the TEM images of (A) Co/γ-Al_2O_3, (B) Co/SiO_2: (1) reduced catalyst, (2) used catalyst without CO_2 addition and (3) used catalyst with CO_2 addition