Electronic Supplementary Information for

Bi-metallic Ni-Co catalyst supported on Mn-Al oxide for selective catalytic CO hydrogenation to higher alcohols

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1 TEM images, HRTEM images, and particle size distributions for the various bimetallic Ni-Co catalysts.



Fig. S1 TEM images, HRTEM images, and particle size distributions for the bi-metallic Ni–Co catalysts with various Ni/Co molar ratios: (a and b) Ni/Co = 2/6, (c and d) Ni/Co = 3/5, (e and f) Ni/Co = 4/4, and (g and h) Ni/Co = 6/2. The particle size distributions were based on 150 particles counted in various regions.

2 Line scan profiles of Ni and Co population in the various bi-metallic Ni-Co catalysts.



Fig. S2 Line scan profiles of Ni and Co population in the bi-metallic Ni–Co catalysts with various Ni/Co molar ratios: (a and b) Ni/Co = 2/6, (c and d) Ni/Co = 3/5, (e and f) Ni/Co = 4/4, and (g and h) Ni/Co = 6/2.

3 XPS spectra of Mn 2p and Al 2p for the various bi-metallic Ni-Co catalysts.



Fig. S3 XPS spectra of the bi-metallic Ni-Co catalysts with various Ni/Co molar ratios. (a) Mn 2p, (b) Al 2p

4 XRD patterns of the Ni5-Co3 catalyst before and after reaction.



Fig. S4 XRD patterns of the Ni5–Co3 catalyst before and after reaction.

5 Catalytic performance with reaction time on stream (240 h) on the various bimetallic Ni-Co catalysts.



Fig. S5 Catalytic performance with reaction time on stream (240 h) on the bi-metallic Ni–Co catalysts with various Ni/Co molar ratios: (a) Ni/Co = 2/6, (b) Ni/Co = 3/5, (c) Ni/Co = 4/4, and (d) Ni/Co = 6/2. The reaction was carried out at T = 260 °C, P = 5 MPa, GHSV = 5000 h^{-1} , and H₂/CO = 2.