

Figure captions

Figure 1. Catalytic performance in steam gasification of biomass over the catalysts after H₂ reduction.

Conditions: biomass; 60 mg/min (H₂O 9.2 %, C 2191 μmol/min; H 3543 μmol/min; O 1475 μmol/min), N₂ flow rate; 60 ml/min, (added H₂O)/C=0.5 (steam flow rate 1110 μmol/min), reaction time; 15 min. H₂ reduction 773 K, 30 min.

Loading amount; Ni 4 wt%; Rh, Pt 0.1 wt%; Ru 0.5 wt%, when unindicated.

Figure 2. Catalytic performance in steam gasification of biomass over the catalysts without H₂ reduction.

Conditions: biomass; 60 mg/min (H₂O 9.2 %, C 2191 μmol/min; H 3543 μmol/min; O 1475 μmol/min), N₂ flow rate; 60 ml/min, (added H₂O)/C=0.5 (steam flow rate 1110 μmol/min), reaction time; 15 min.

Loading amount; Ni 4 wt% ; Pd, Rh 0.1 wt%; Ru 0.5 wt%, when unindicated.

Figure 3. Catalytic performance in steam gasification of biomass over the catalysts without H₂ reduction.

Conditions: biomass; 60 mg/min (H₂O 9.2 %, C 2191 μmol/min; H 3543 μmol/min; O 1475 μmol/min), N₂ flow rate; 60 ml/min, (added H₂O)/C=0.5 (steam flow rate 1110 μmol/min), reaction time; 15 min.

Loading amount; Ni 4 wt% ; Pd, Rh, Pt 0.1 wt%; Ru 0.5 wt%, when unindicated.

Figure 4. Effect of steam to carbon ratio in steam gasification of biomass over Ni/CeO₂/Al₂O₃ and Pt/Ni/CeO₂/Al₂O₃ without H₂ reduction.

Conditions: biomass; 60 mg/min (H₂O 9.2 %, C 2191 μmol/min; H 3543 μmol/min; O 1475 μmol/min), N₂ flow rate; 60 ml/min, (added H₂O)/C=0.5, 1.0 (steam flow rate 1110, 2220 μmol/min), reaction time; 15 min.

Loading amount; Ni 4 wt% ; Pt 0.1 wt%, when unindicated.

Figure 5. TPR profiles of the catalysts.

(a) M/Ni/CeO₂/Al₂O₃, (b) M/CeO₂/Al₂O₃ (M=Pt, Rh, Ru, Pd)

TPR conditions: heating rate 10 K/min, room temperature to 973 K, 5% H₂/Ar : 30 ml/min,
Sample weight : 50 mg-cat.

Broken line represents a TPR profile of Ni/CeO₂/Al₂O₃ for the comparison.

Loading amount; Ni 4 wt%; Pd, Rh, Pd 0.1 wt%; Ru 0.5 wt%, when unindicated.

Figure 6. Results of Pt *L*₃- and Ru *K*-edge EXAFS analysis of the catalysts reduced at 773 K.

(a) *k*³-weighted EXAFS oscillations, Fourier filtered EXAFS data (solid line), and calculated data (dotted line). Fourier filtering range : 0.160-0.267 nm.

(b) Fourier transforms of *k*³-weighted Pt *L*₃-edge EXAFS, FT range : 30-128 nm⁻¹.

(c) *k*³-weighted EXAFS oscillations, Fourier filtered EXAFS data (solid line), and calculated data (dotted line). Fourier filtering range : 0.160-0.267 nm.

(d) Fourier transforms of *k*³-weighted Ru *K*-edge EXAFS, FT range : 30-128 nm⁻¹.

Figure 7. Results of Ni *K*-edge EXAFS analysis of the catalysts reduced at 773 K.

(a) *k*³-weighted EXAFS oscillations.

(b) Fourier transforms of *k*³-weighted Ni *K*-edge EXAFS, FT range : 30-160 nm⁻¹.

(c) Fourier filtered EXAFS data (solid line) and calculated data (dotted line).

Fourier filtering range : 0.150-0.279 nm.

Figure 8. Results of Ni *K*-edge EXAFS analysis of the catalysts after the temperature programmed reduction from room temperature to 550 K.

(a) k^3 -weighted EXAFS oscillations.

(b) Fourier transforms of k^3 -weighted Ni *K*-edge EXAFS, FT range : 30-160 nm⁻¹.

(c) Fourier filtered EXAFS data (solid line) and calculated data (dotted line).

Fourier filtering range : 0.132-0.322 nm.

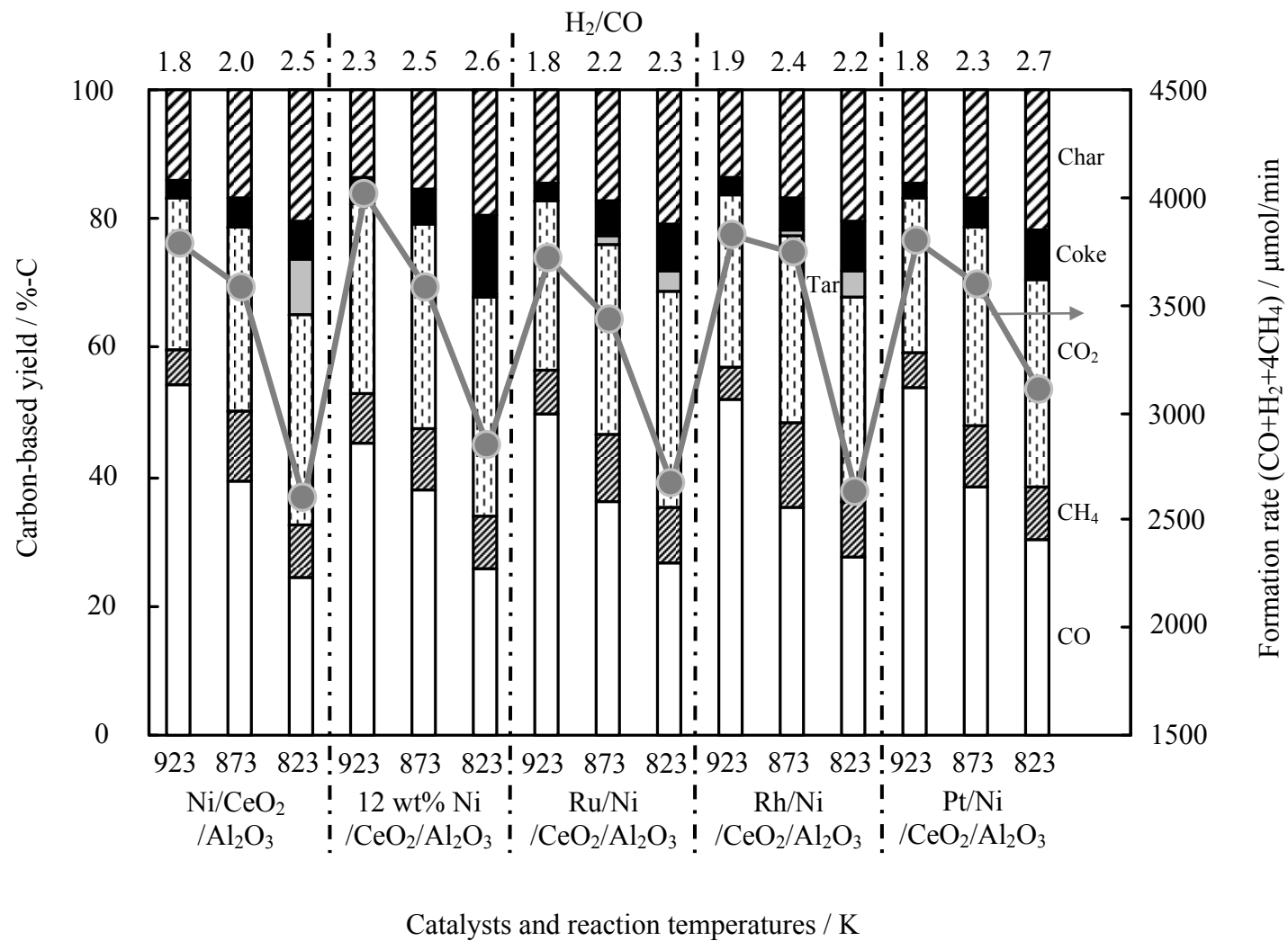


Figure 1.

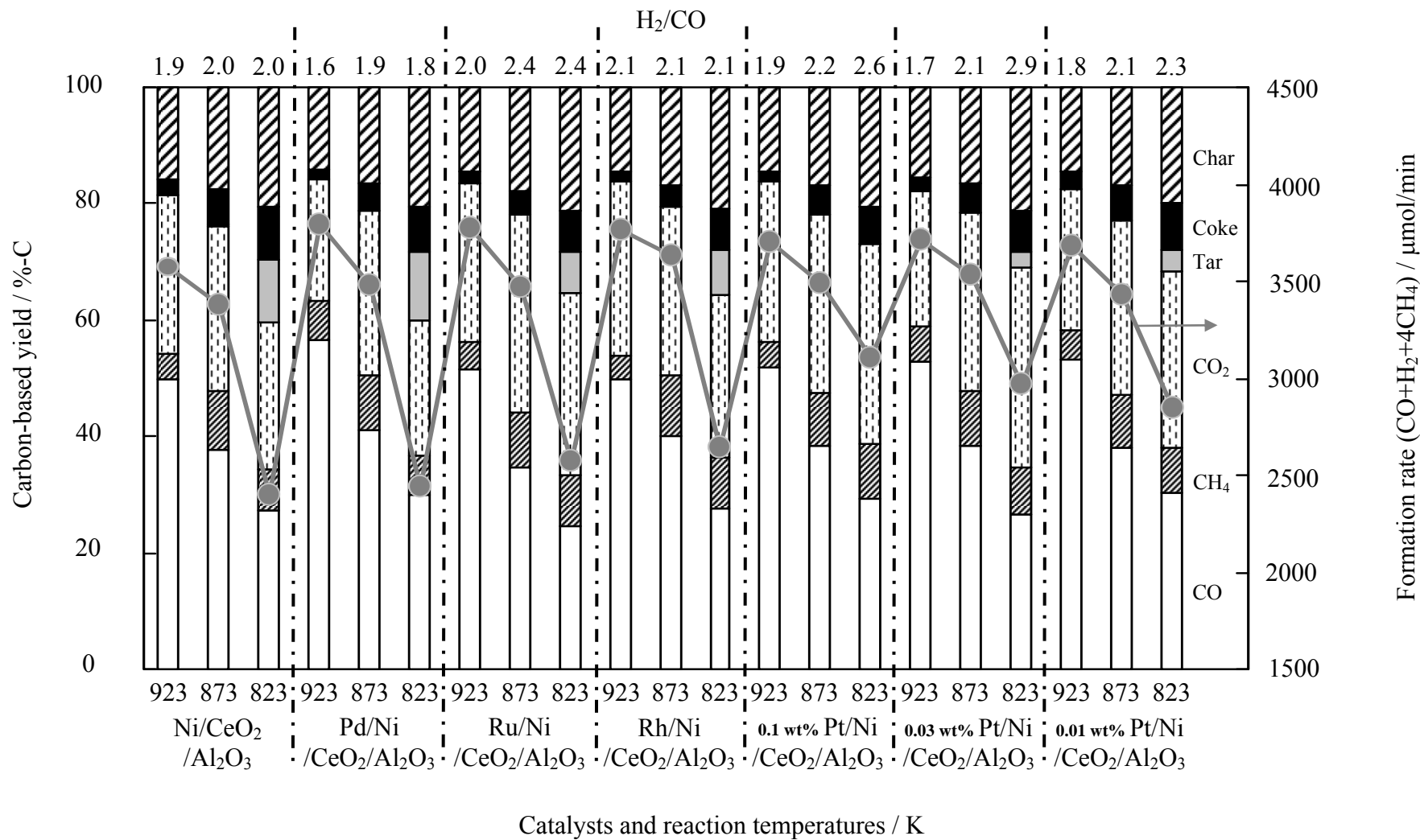


Figure 2.

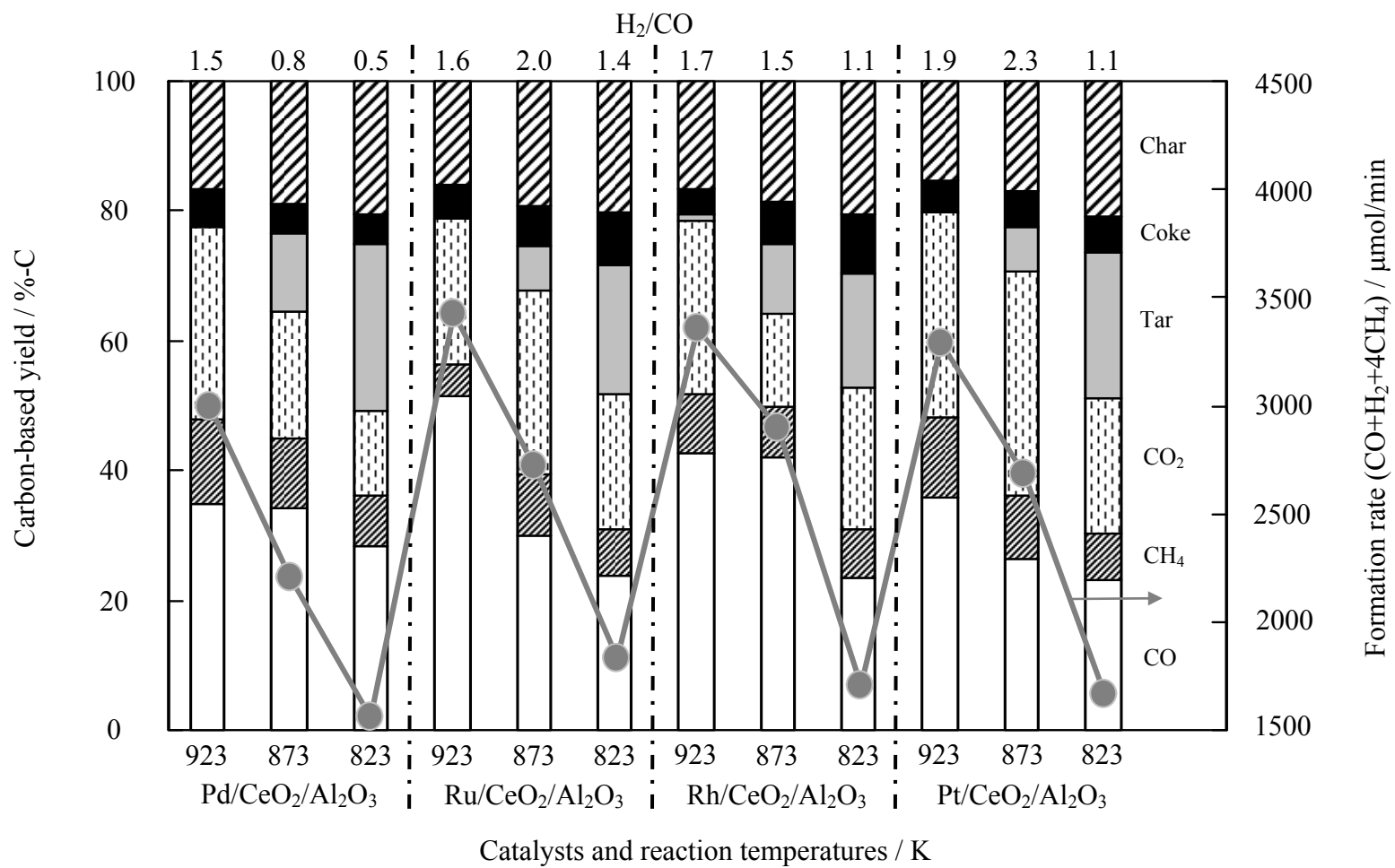


Figure 3.

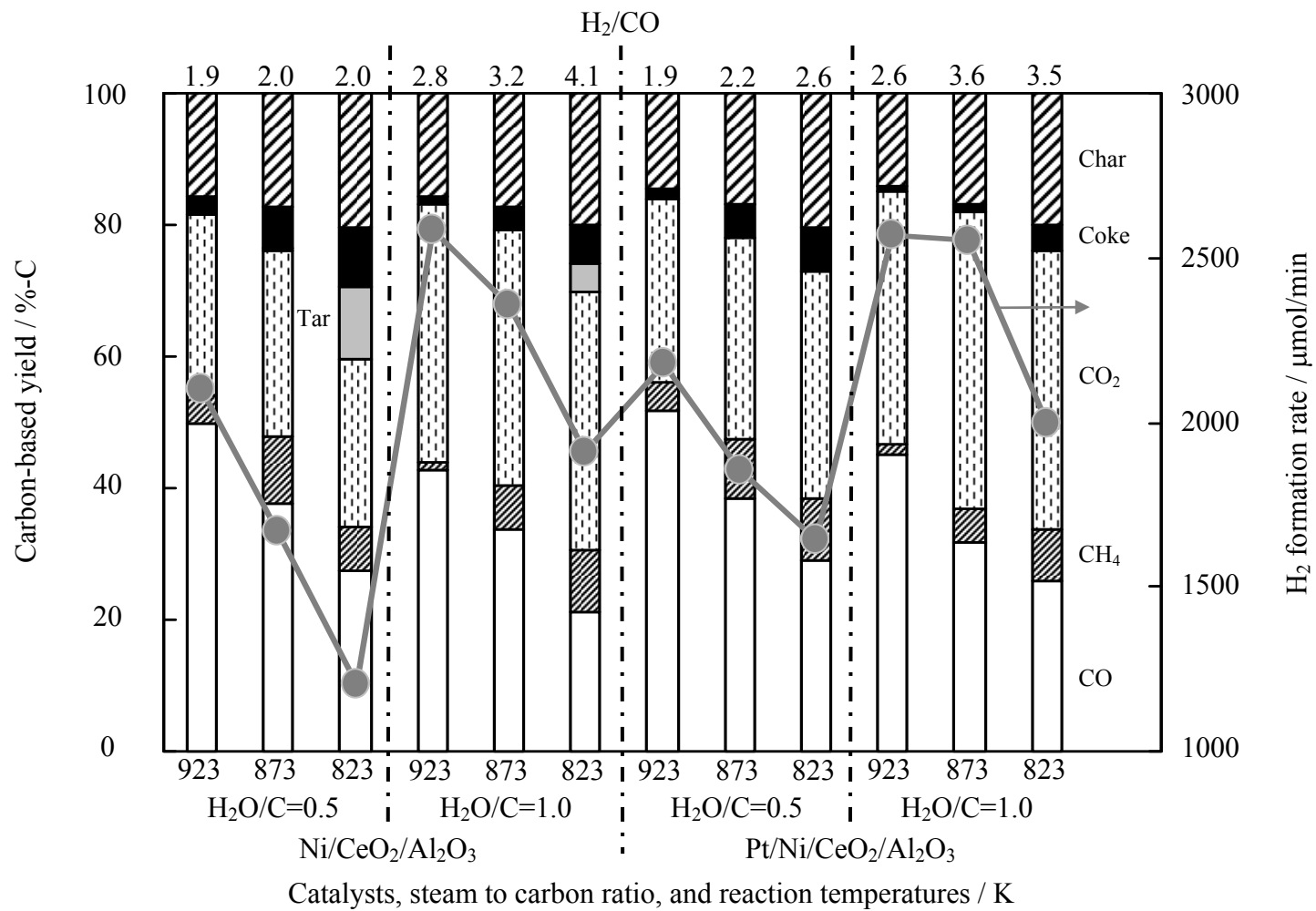


Figure 4.

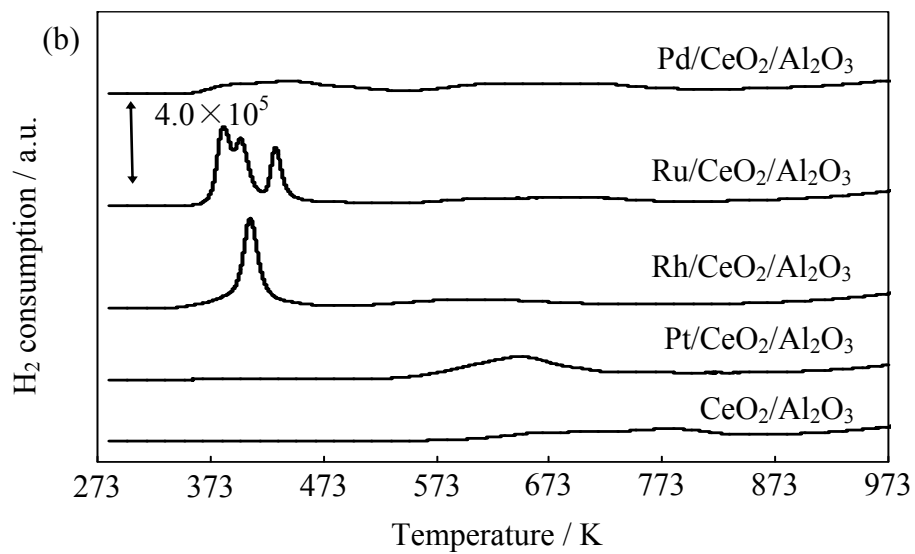
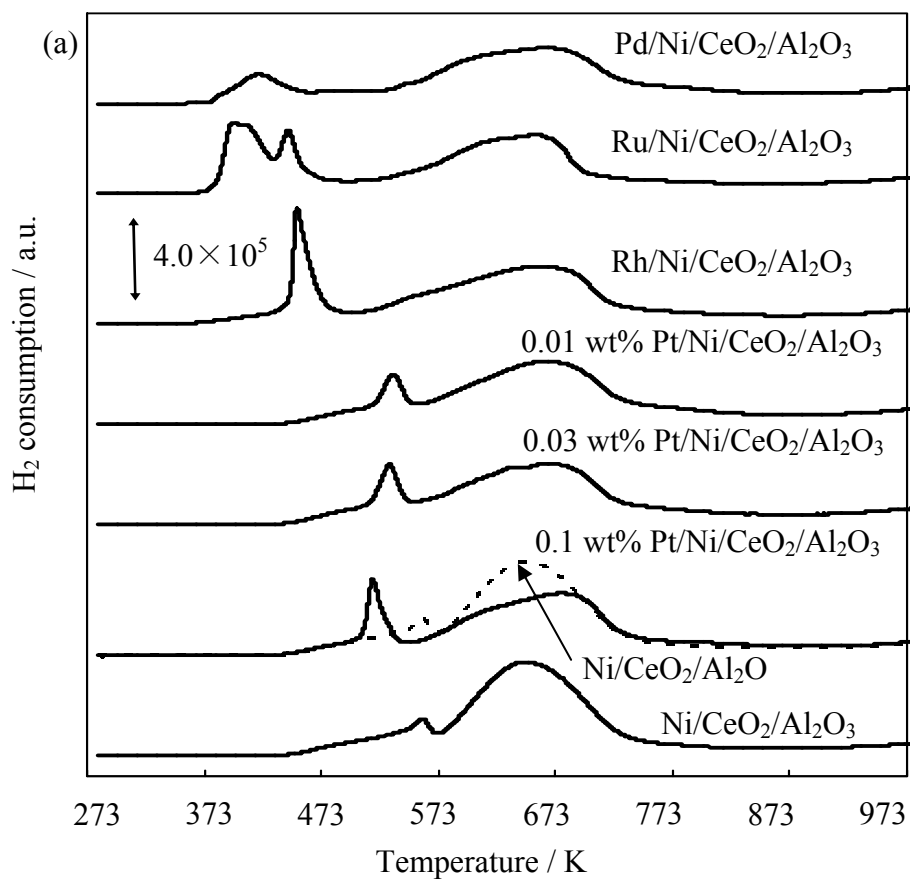


Figure 5.

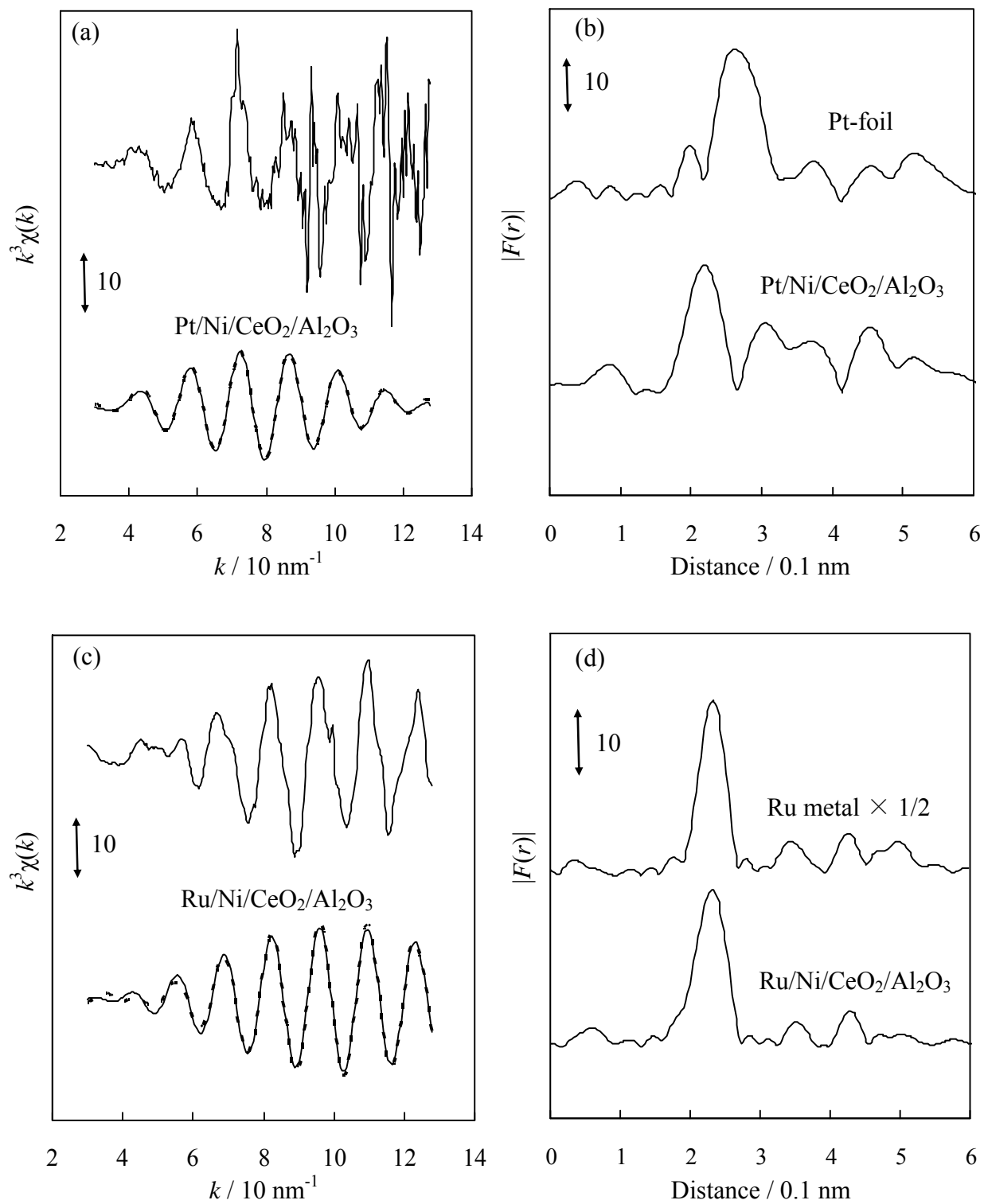


Figure 6.

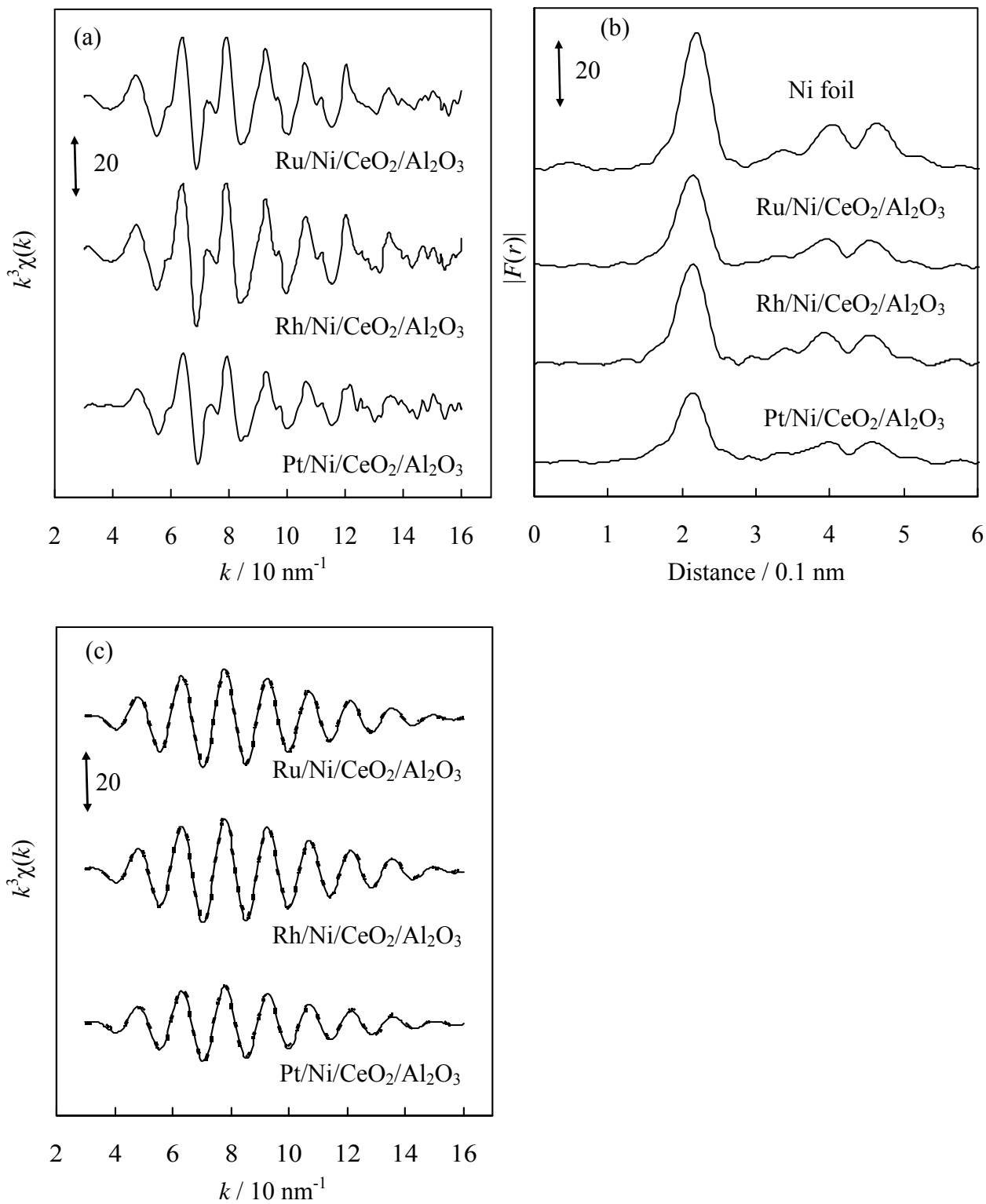


Figure 7.

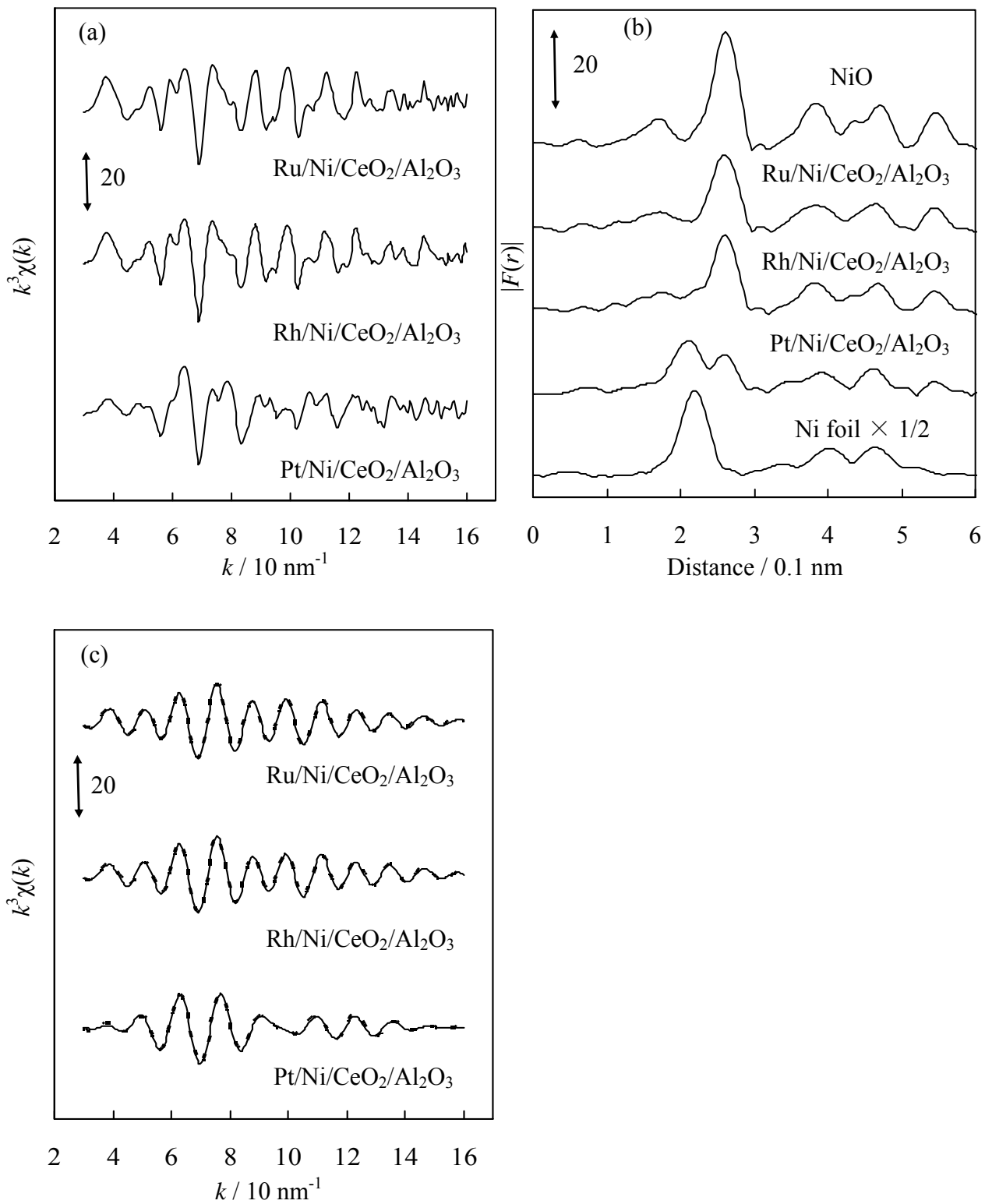


Figure 8.