

Supporting information

**Alumina-Supported Bimetallic Catalysts with Ruthenium and CoNi
for Enhanced Ammonia Decomposition**

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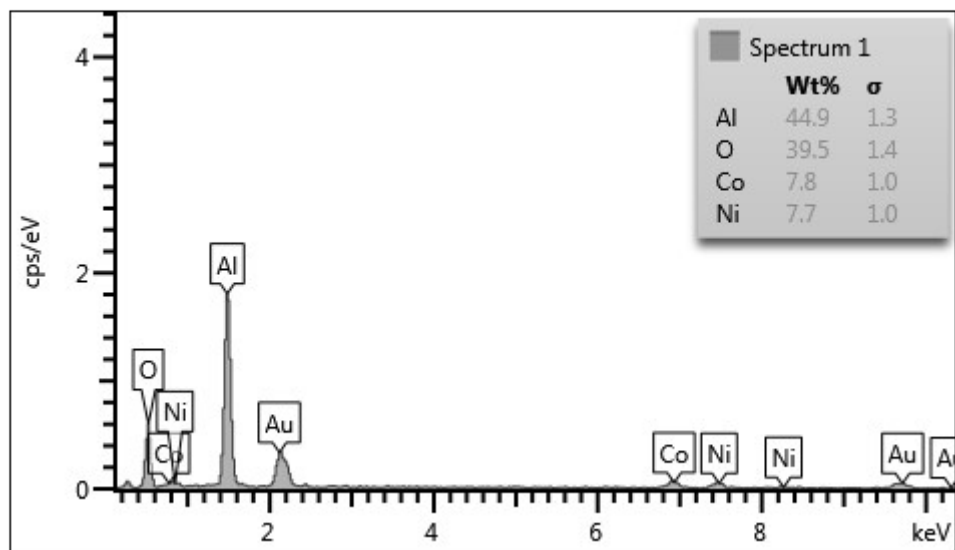


Figure S1. EDX Spectrum of 0.5Ru-10%CoNi/Al₂O₃

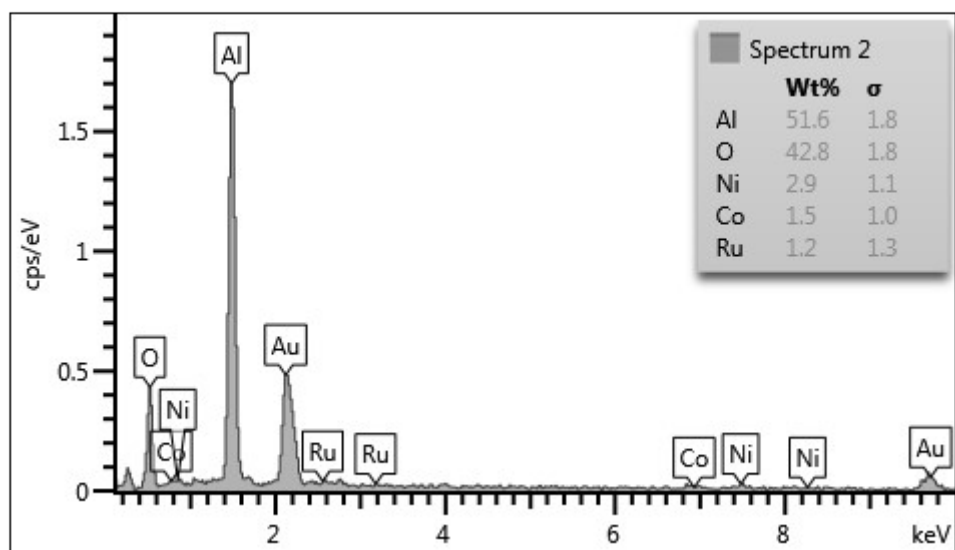


Figure S2. EDX Spectrum of 0.5Ru-20%CoNi/Al₂O₃

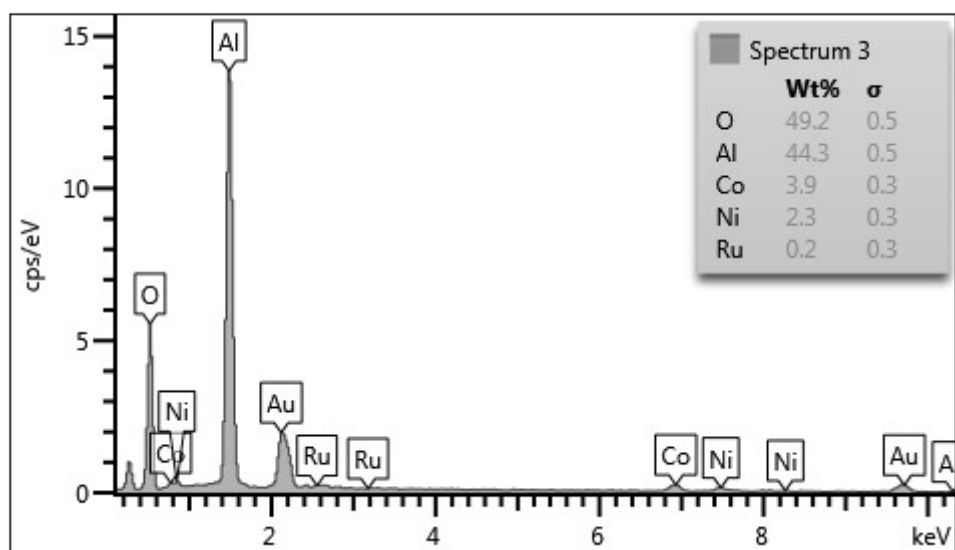


Figure S3. EDX Spectrum of 0.5Ru-30%CoNi/Al₂O₃

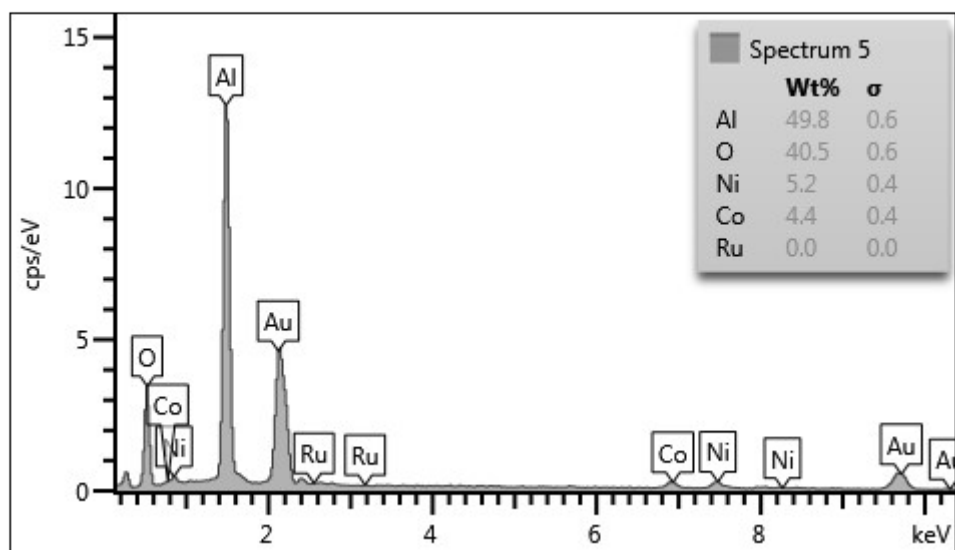


Figure S4. EDX Spectrum of 0.5Ru-50%CoNi/Al₂O₃

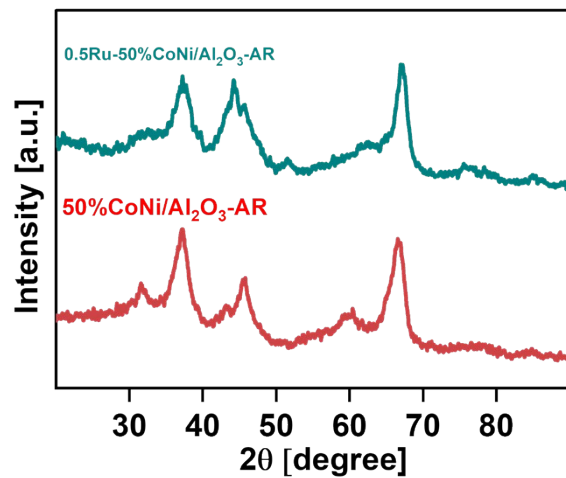


Figure S5. X-ray diffraction patterns of the used 50%CoNi/Al₂O₃-AR and 0.5Ru-50%CoNi/Al₂O₃-AR catalysts

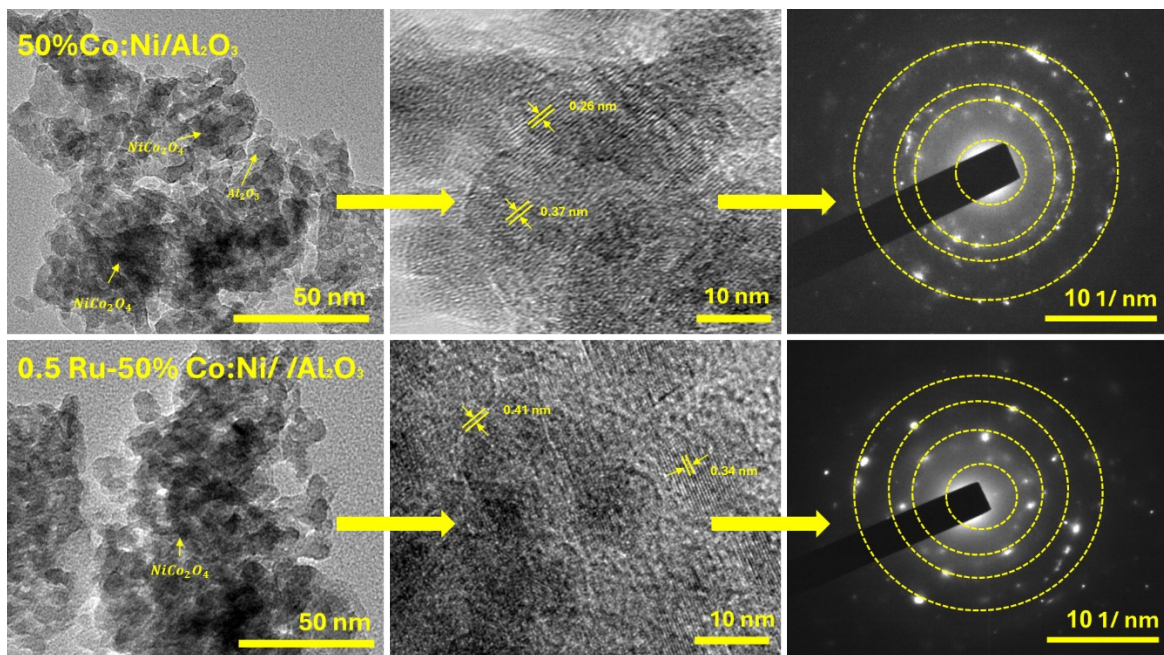


Figure S6. TEM images of 50%CoNi/Al₂O₃ and 0.5Ru-50%CoNi/Al₂O₃ catalysts

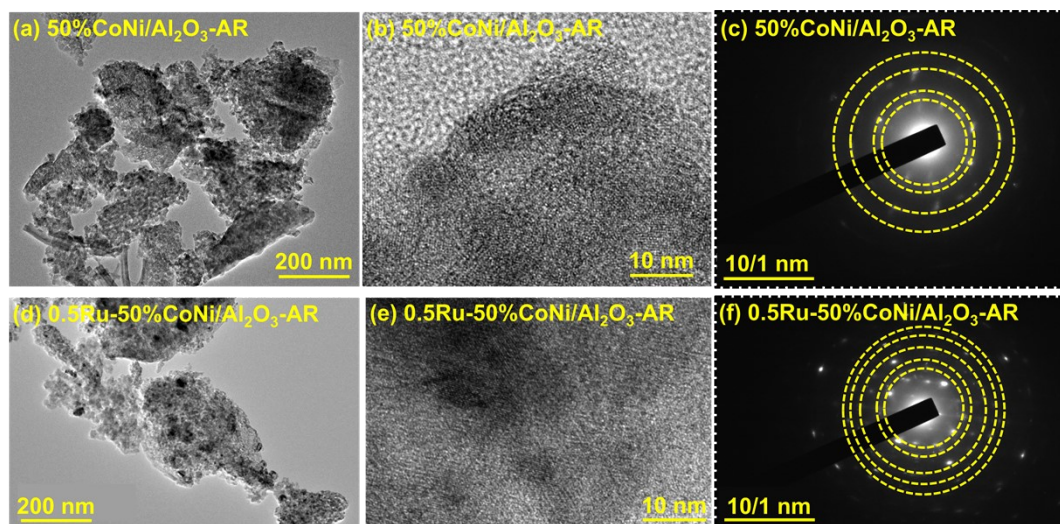


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S7. (a) TEM (b) HRTEM and (c) SAED images of used catalysts 50%CoNi/Al₂O₃-AR and 0.5Ru-50%CoNi/Al₂O₃-AR catalysts collected after the reaction.

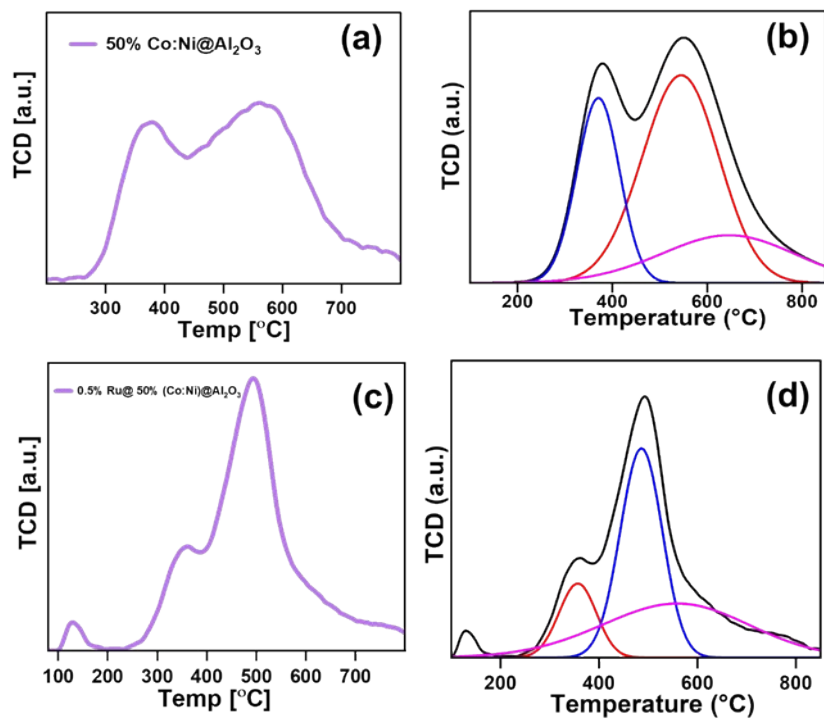


Figure S8. H₂-TPR of 50%CoNi/Al₂O₃ (a) TPR (b) Deconvolution; and 0.5Ru-50%CoNi/Al₂O₃ (c) TPR (b) Deconvolution.

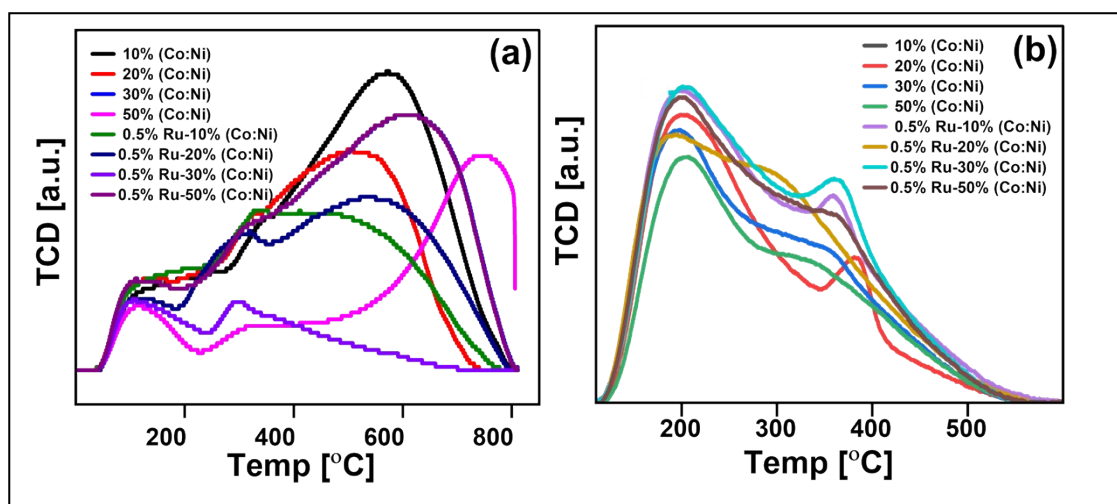


Figure S9: TPD profiles (a) CO₂ and (b) NH₃

Table S1: Table for hydrogen consumption obtained from H₂-TPR

Catalyst Name	H ₂ consumed (mmol/g)
5% Ni	0.077
5% Co	0.095
5% Co:Ni	0.028
10% Co:Ni	0.052
20% Co:Ni	0.071
30% Co:Ni	0.083
50% Co:Ni	0.094
0.5% Ru/ 5% Ni	0.045
0.5% Ru/ 5% Co	0.091
0.5% Ru/ 5% Co:Ni	0.118

0.5% Ru/ 10% Co:Ni	0.049
0.5% Ru/ 20% Co:Ni	0.084
0.5% Ru/ 30% Co:Ni	0.089
0.5% Ru/ 50% Co:Ni	0.191

(END)