

Fe-assisted Ru clusters supported on porous and graphitic carbon for ammonia decomposition to CO_x free hydrogen

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Table S1 XPS studies performed on two different ruthenium catalysts: peak integration of the 2p Fe and 3d Ru features.

Samples	% Fe 2p	% Ru 3d	% C 1s	% O 1s	Fe/Ru
Ru/Fe-C	0.69	0.57	94.27	4.47	1.21
Ru/C[#]	0.53	0.43	94.83	4.22	1.23

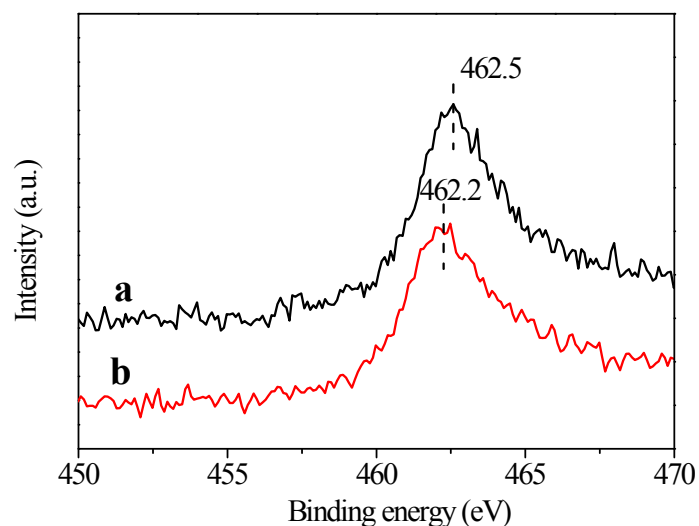


Fig.S1 XPS spectra of the ruthenium 3p_{3/2} region of (a) Ru/Fe-C; (b) Ru/C[#].

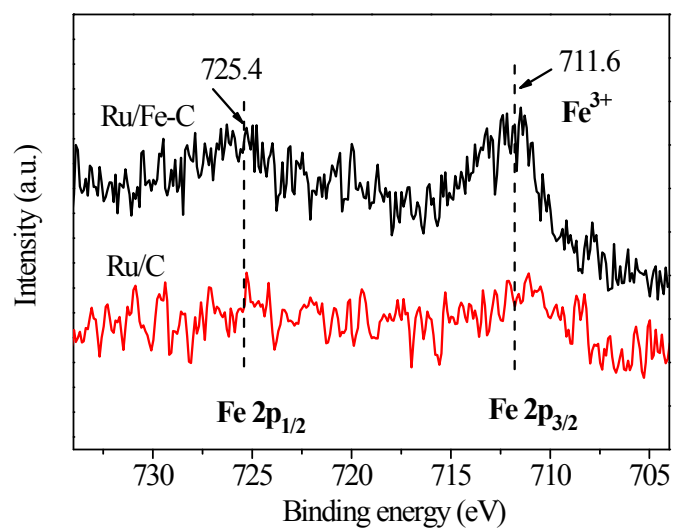
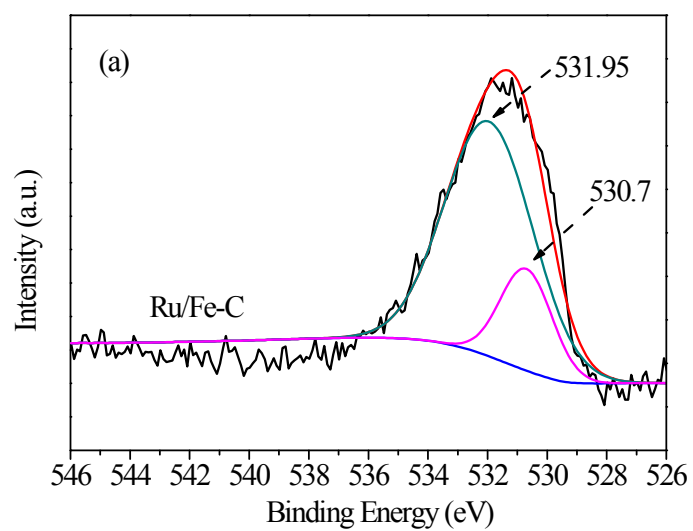


Fig. S2 XPS spectra of the iron 2p region of Ru/Fe-C and Ru/C[#] samples.



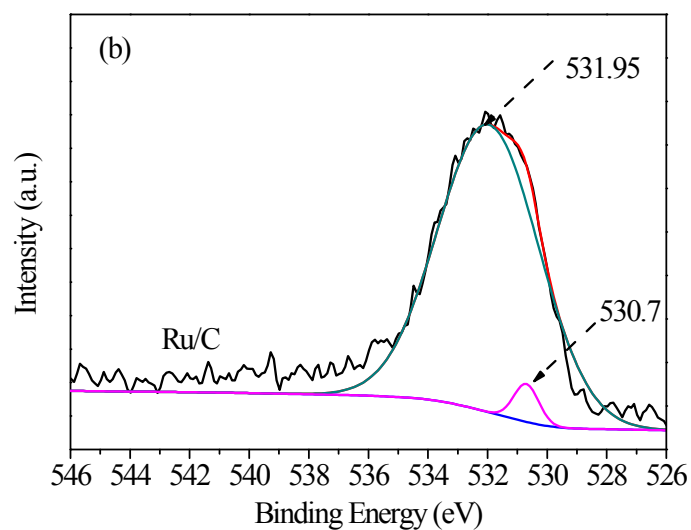


Fig. S3 O1s XPS spectra of (a) Ru/Fe-C and (b) Ru/C[#] catalysts.

Table S2 Comparison of the catalytic performance of Ru/Fe-C with several typical Ru-based carbon supported ammonia decomposition catalysts

Catalyst	Temperatur e (°C)	GHSV (ml h ⁻¹ g _{cat} ⁻¹)	Conversion (%)	H ₂ production rate (mmol min ⁻¹ g _{cat} ⁻¹)	Referenc e
Ru/CMK-3	550	30,000	22.7	7.0	1
Ru/activated carbon	550	30,000	14.4	4.4	2
Ru/CNTs	550	30,000	84.7	26.0	2
Ru/CNTs	500	30,000	84.65	28.35	3
Ru/CNTs	450	30,000	43.7	14.6	4
K-Ru/CNTs	450	30,000	97.3	32.6	4
CS-Ru/graphene	450	30,000	85.8	28.7	5
Ru/CNTs	450	20,000	11.3	2.5	6
Ru/CTF-1	450	20,000	18.2	4.1	6
Ru/Fe-C	450	20,000	13.7	3.1	This study

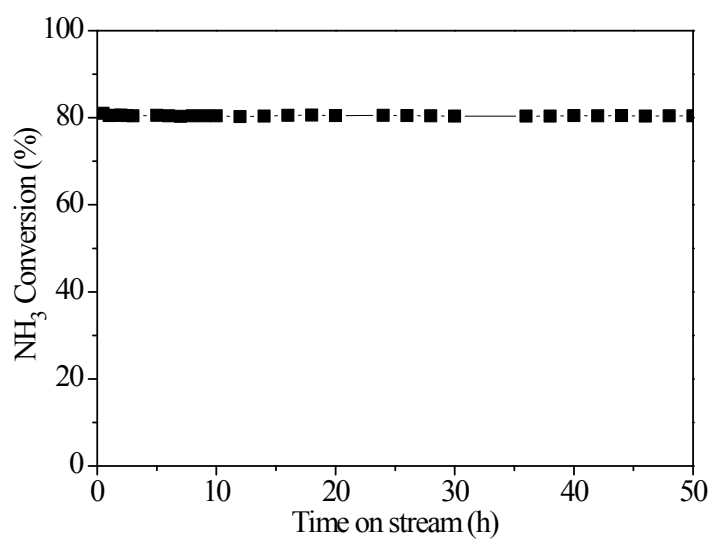


Fig. S4 Time course of ammonia decomposition at 550 °C using Ru/Fe-C as a catalyst.

GHSV= 20 000 ml h⁻¹ g_{cat}⁻¹.

References

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