Supplementary Information for

Effect of Ru/Cl ratio on the reaction of acetylene hydrochlorination

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Table S1 The catalytic performance of some potential non-mercury catalysts recently reported in the literatures.

Catalyst	Composition of catalysts	Reaction conditions	Initial catalytic activity [a]	Deactivation rate (% h^{-1}) [b]
Au1Sn1/AC [1]	1 wt% Au, n(Au)/n(Sn) = 1	T = 170 °C. GHSV(C_2H_2) = 720 h^{-1}, V_{HCl}/V_{C2H2} = 1.1	X_A = 99.3%, Svc_M > 99.0%	0.15
AuPPh3Cl/AC [2]	0.30 wt% Au	T = 170 °C. GHSV(C_2H_2) = 360 h^{-1}, V_{HCl}/V_{C2H2} = 1.1	X_A = 96.3%, Svc_M > 99.0%	0.02
$PdCl_2$-KCl-$LaCl_3$/C [3]	0.9 wt% Pd, 0.2 wt% KCl, 0.2 wt% $LaCl_3$	T = 120-180 °C. GHSV(C_2H_2) = 120 h^{-1}, V_{HCl}/V_{C2H2} = 1.15	X_A = 98.0%, Svc_M > 99.5%	10.5
Ru/SAC-C300 [4]	1 wt% Ru	T = 170 °C. GHSV(C_2H_2) = 180 h^{-1}, V_{HCl}/V_{C2H2} = 1.1	X_A = 96.5%, Svc_M > 99.9%	0.05
Ru1K1/SAC [5]	1 wt% Ru, n(Ru)/n(K) = 1	T = 170 °C. GHSV(C_2H_2) = 180 h^{-1}, V_{HCl}/V_{C2H2} = 1.1	X_A = 99.8%, Svc_M > 99.0%	0.14
(Ru_5Cl_7)-P/AC	1 wt% Ru	T = 180 °C. GHSV(C_2H_2) = 180 h^{-1}, V_{HCl}/V_{C2H2} = 1.15	X_A = 97.0%, Svc_M > 99.0%	0.01

[a] X_A represents the initial conversion of acetylene and S_{VCM} represents the selectivity to VCM of the catalyst.

[b] Deactivation rate was defined as (the initial maximum C_2H_2 conversion – the final C_2H_2 conversion)/(deactivation period, h).

Table S2 The molar ratio of ruthenium and chlorine in the fresh Ru-based catalysts, determined by XPS spectra.

Samples	Ru (wt %)	Cl (wt %)	Molar(Ru)/ Molar(Cl)
Fresh Ru^0/AC	80.34	19.66	1.43
Fresh $RuCl_3$/AC	49.20	50.80	0.34
Fresh Ru_5Cl_5/AC	77.87	22.13	1.20
Fresh Ru_5Cl_7/AC	66.39	33.61	0.69
Fresh Ru_5Cl_9/AC	61.73	38.27	0.56

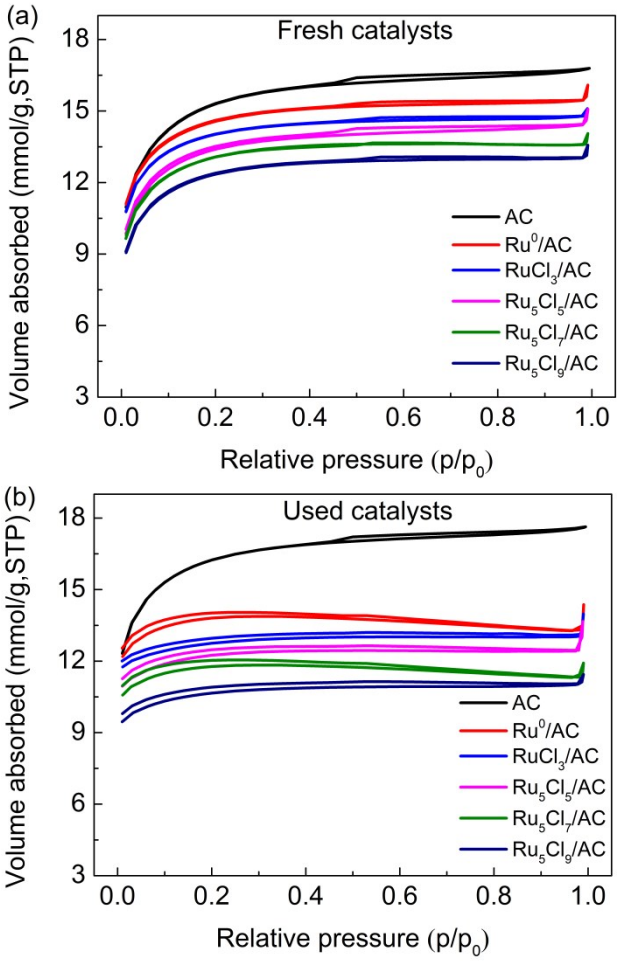


Fig. S1 Nitrogen adsorption-desorption isotherms of the fresh (a) and used (b) catalysts.

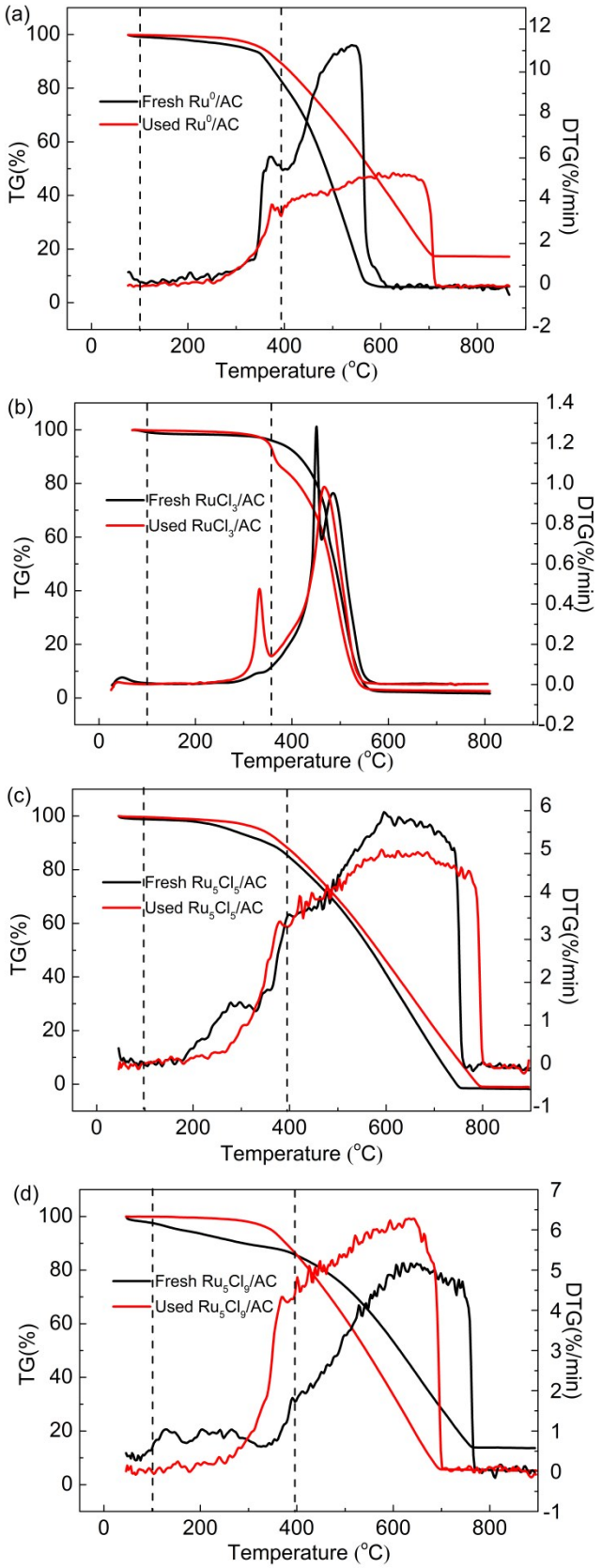
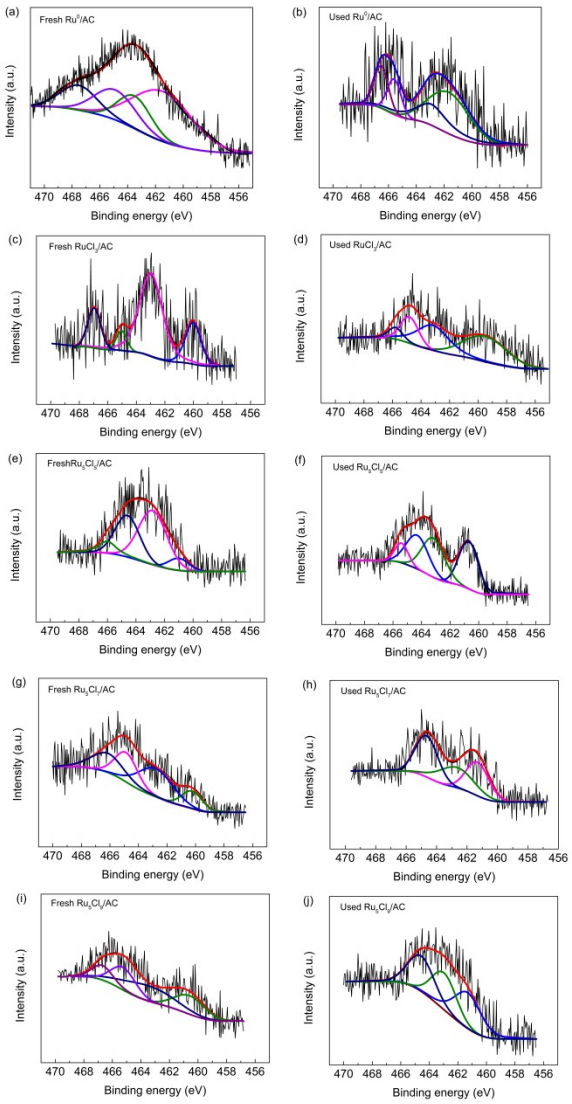


Fig. S2 Thermogravimetric analysis (TGA) curves of fresh and used catalysts recorded in air atmosphere.



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31 **Fig. S3** High-resolution XPS spectra of Ru 3p of the fresh and used catalysts.

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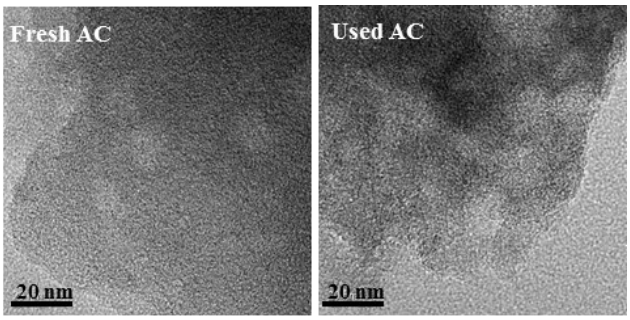

Fig. S4 TEM images of the fresh and used AC catalysts.

References

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