

## Supplementary Materials

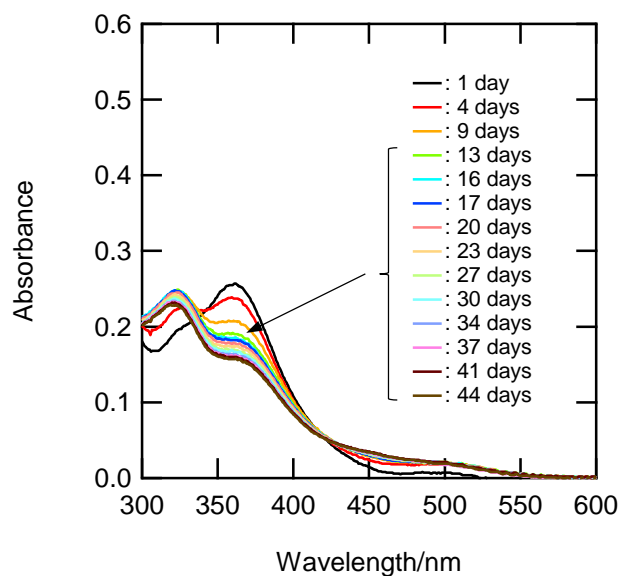
# Speciation of Ruthenium(III) Chloro Complexes in Hydrochloric Acid Solutions and Their Extraction Characteristics With an Amide-containing Amine Compound

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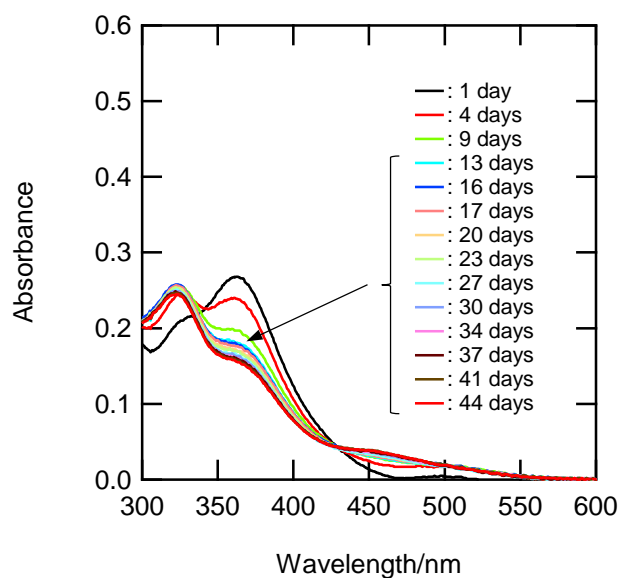
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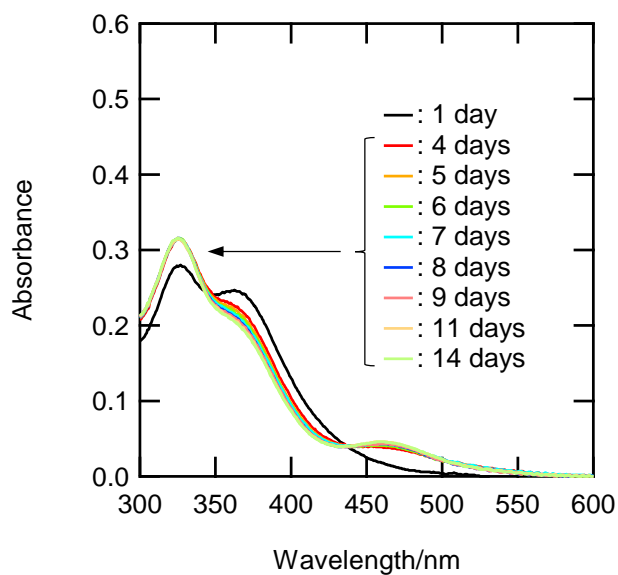
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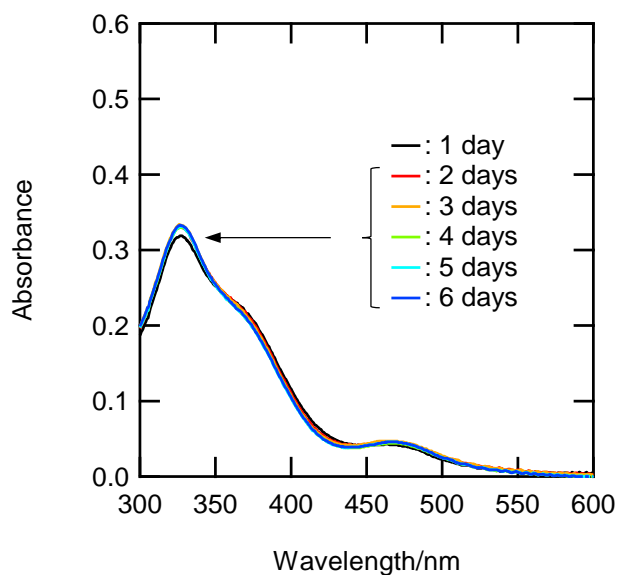
**Figure S1.** UV-Vis spectra for the 0.5 M HCl-Ru solution at various standing times. [Ru] = 0.9 mM; standing times: 1, 4, 9, 13, 16, 17, 20, 23, 27, 30, 34, 37, 41, and 44 days; and optical path length: 0.20 cm.



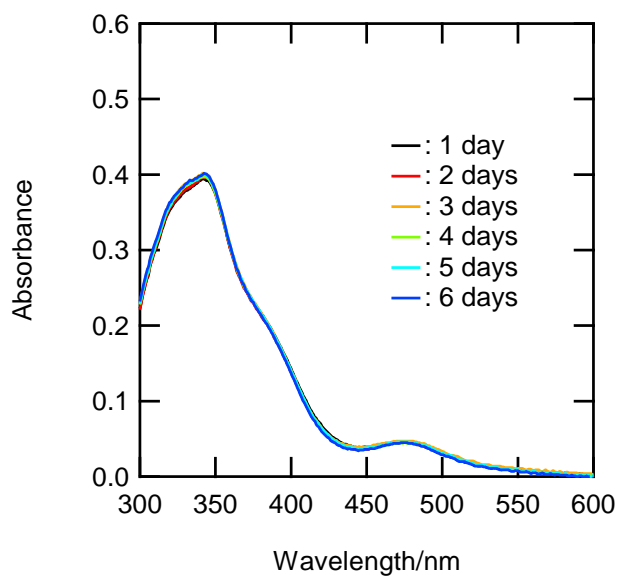
**Figure S2.** UV-Vis spectra for the 0.7 M HCl-Ru solution at various standing times. [Ru] = 0.9 mM; standing times: 1, 4, 9, 13, 16, 17, 20, 23, 27, 30, 34, 37, 41, and 44 days; and optical path length: 0.20 cm.



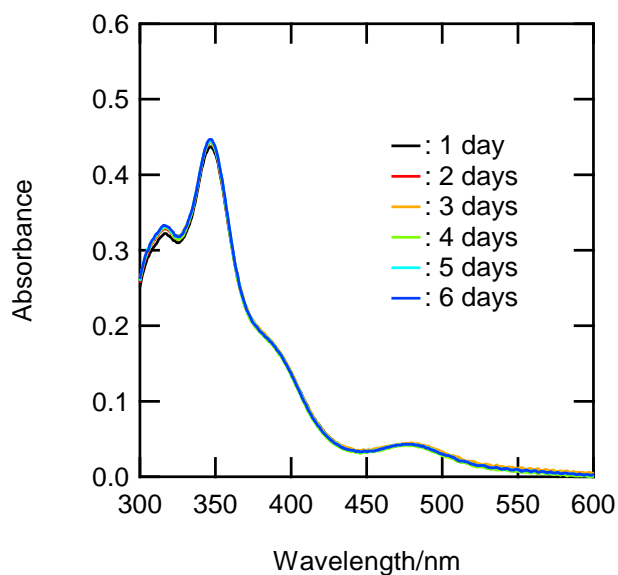
**Figure S3.** UV-Vis spectra for the 2 M HCl-Ru solution at various standing times. [Ru] = 0.9 mM; standing times: 1, 4, 5, 6, 7, 8, 9, 11, and 14 days; and optical path length: 0.20 cm.



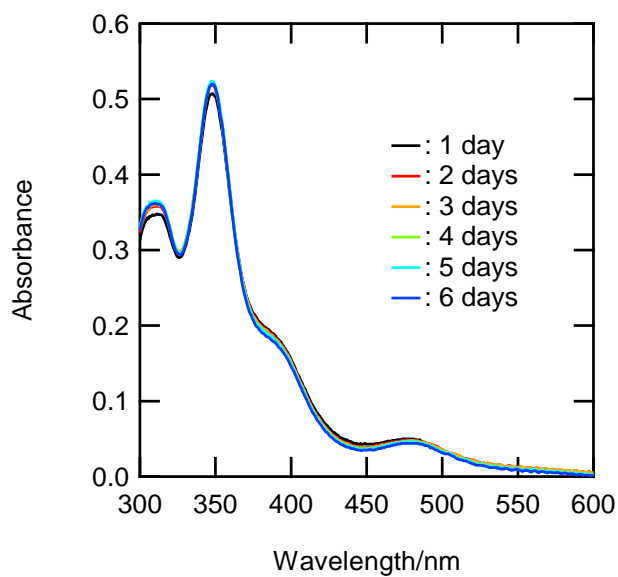
**Figure S4.** UV-Vis spectra for the 3 M HCl-Ru solution at various standing times. [Ru] = 0.9 mM; standing times: 1, 2, 3, 4, 5, and 6 days; and optical path length: 0.20 cm.



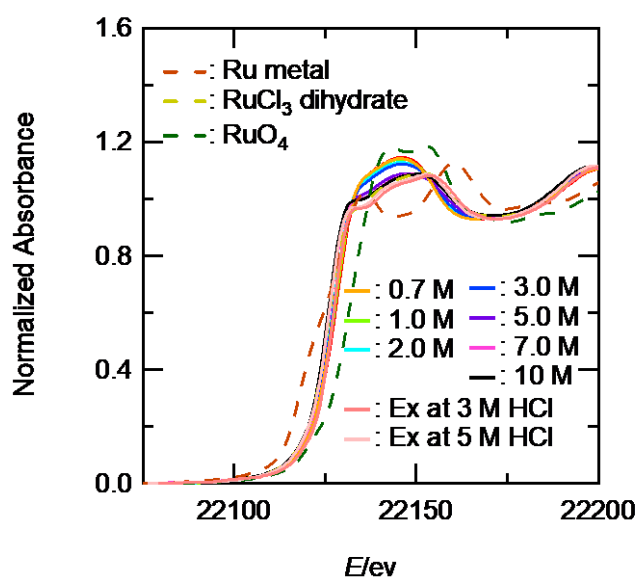
**Figure S5.** UV-Vis spectra for the 5 M HCl-Ru solution at various standing times. [Ru] = 0.9 mM; standing times: 1, 2, 3, 4, 5, and 6 days; and optical path length: 0.20 cm.



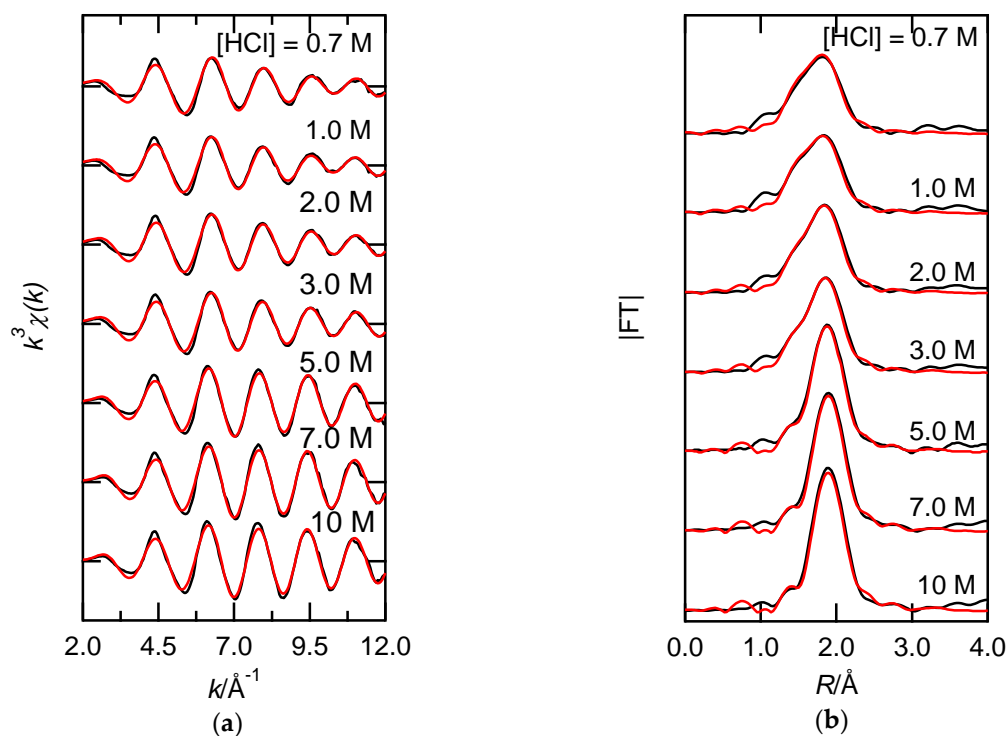
**Figure S6.** UV-Vis spectra for the 7 M HCl-Ru solution at various standing times. [Ru] = 0.9 mM; standing times: 1, 2, 3, 4, 5, and 6 days; and optical path length: 0.20 cm.



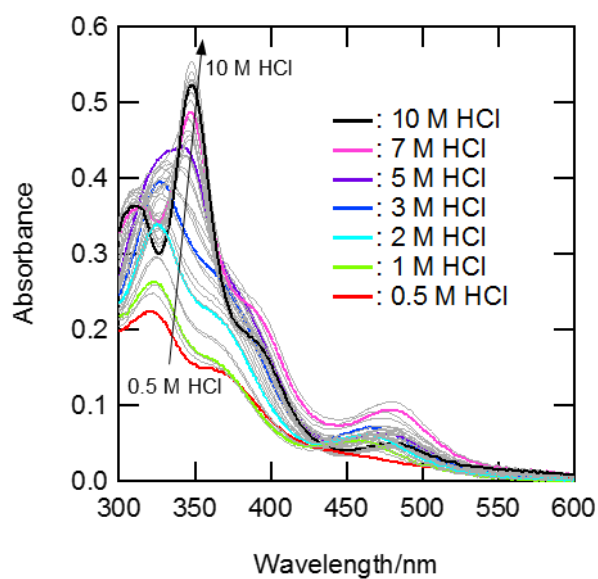
**Figure S7.** UV-Vis spectra for the 10 M HCl-Ru solution at various standing times. [Ru] = 0.9 mM; standing times: 1, 2, 3, 4, 5, and 6 days; and optical path length: 0.20 cm.



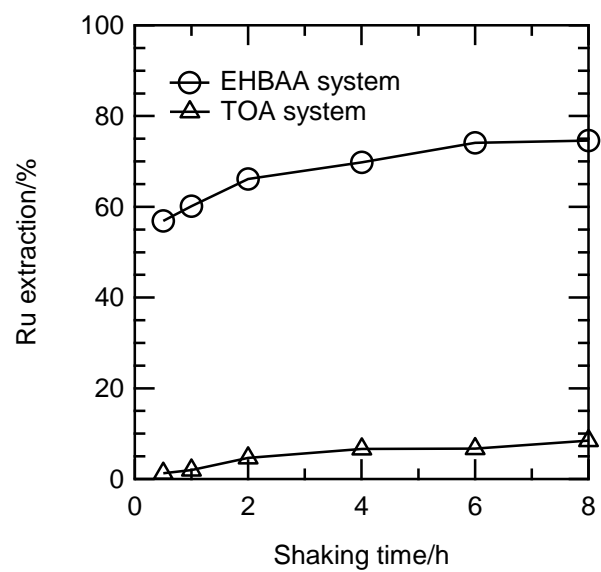
**Figure S8.** Comparison of XANES spectra for the Ru complexes in aqueous and organic solutions with those of Ru metal, RuCl<sub>3</sub> dihydrate, and RuO<sub>4</sub>.



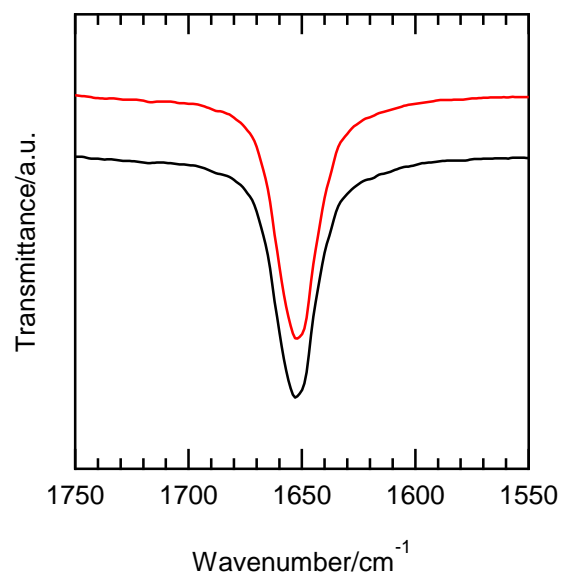
**Figure S9.** (a) The Ru K-edge  $k^3$ -weighted EXAFS spectra and (b) the corresponding Fourier transforms for the Ru(III) in 0.7–10 M HCl solutions. Experimental data (black lines) and theoretical fit (red lines) are shown. The phase shifts are not corrected.



**Figure S10.** The UV-Vis spectra of HCl solutions (0.5–10 M) containing 0.9 mM Ru(III).



**Figure S11.** Extraction percentages of Ru with 0.5 M EHBAA and TOA in  $\text{CHCl}_3$  versus shaking time.  $[\text{Ru}] = 1$  mM;  $[\text{HCl}] = 3$  M.



**Figure S12.** The FT-IR spectra of dodecane containing 0.5 M EHBAA with pre-equilibrium by HCl (black line) and that medium posterior to extraction of Ru(III) in 5 M HCl (red line).