Supplementary data for:

Development of Adsorption-Desorption Technique of Rare-Earth Metal Ions using Phase Transition Behavior of Zwitterionic Polymer Brushes

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Equations:

Equation S1:
Polymer mass per gram silica:

$$W = \frac{5.332\ mg\ polymer\ (from\ TG)}{7.958\ mg\ silica\ (from\ TG)} = 0.67\ g/g$$

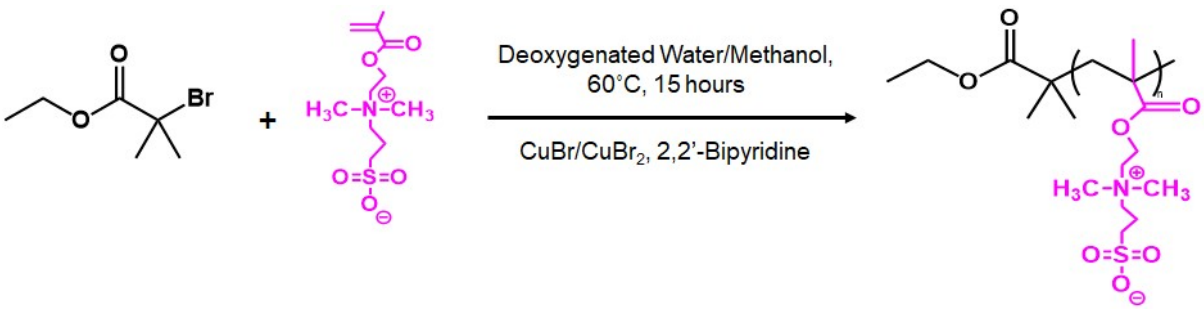
Equation S2:
Number of chains per gram silica:

$$N_{chains/g} = \frac{W}{M_n} \times N_A = \frac{0.67}{13160} \times 6.022 \times 10^{23} = 3.066 \times 10^{19} chains/g$$

Equation S3:
Thus, the density would be:

$$\sigma = \frac{\frac{N_{chains}}{g}}{S} = \frac{3.066 \times \frac{10^{19} chains}{g}}{\frac{200 m^2}{g}} = 0.1533 \times \frac{10^{18} chains}{m^2} = 0.1533\ chains/nm^2$$

Scheme:



Scheme S1 Schematic illustrations of synthesis procedure of bulk poly(DMAPS).

Figures:

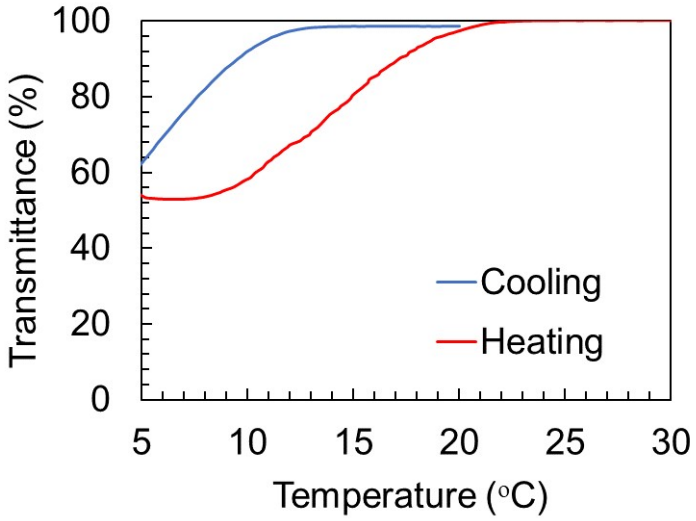


Figure S1. Temperature dependence of optical-transmittance plots for a poly(DMAPS)-containing aqueous solution under cooling and heating processes.

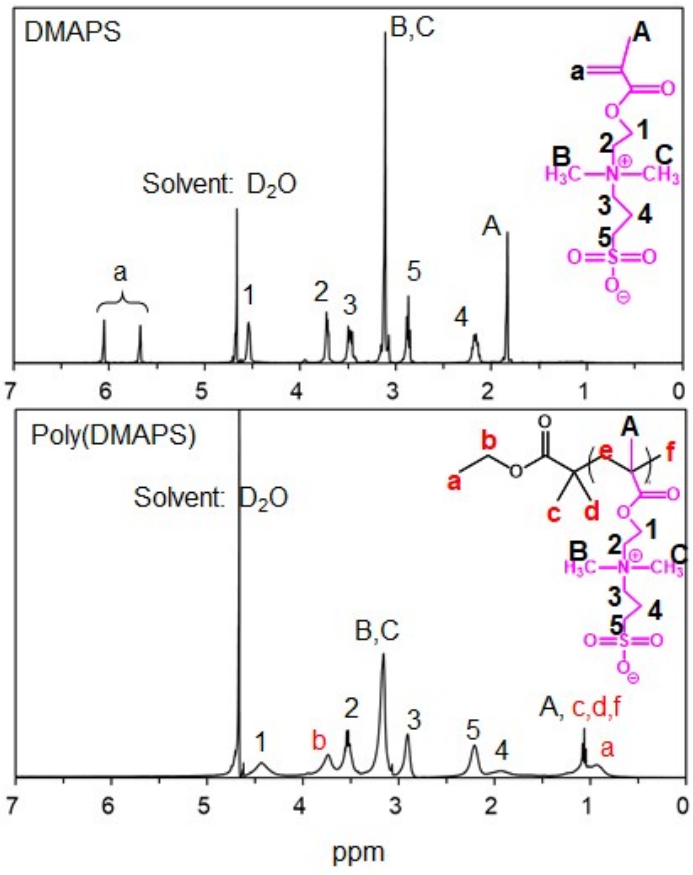


Figure S2. ^{1}H-NMR spectra of DMAPS monomer and the synthesized bulk poly(DMAPS).

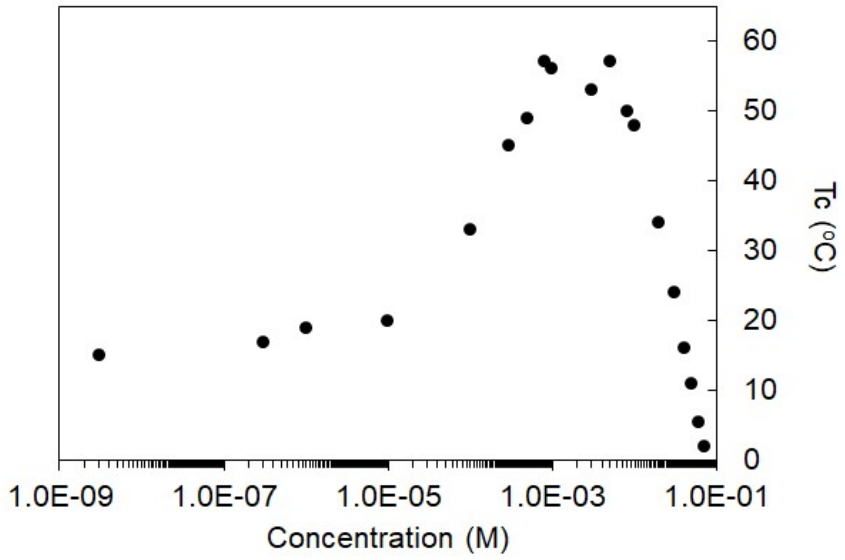


Figure S3. La(III) concentration dependence of Tc of poly(DMAPS) in aqueous solutions containing La ions.

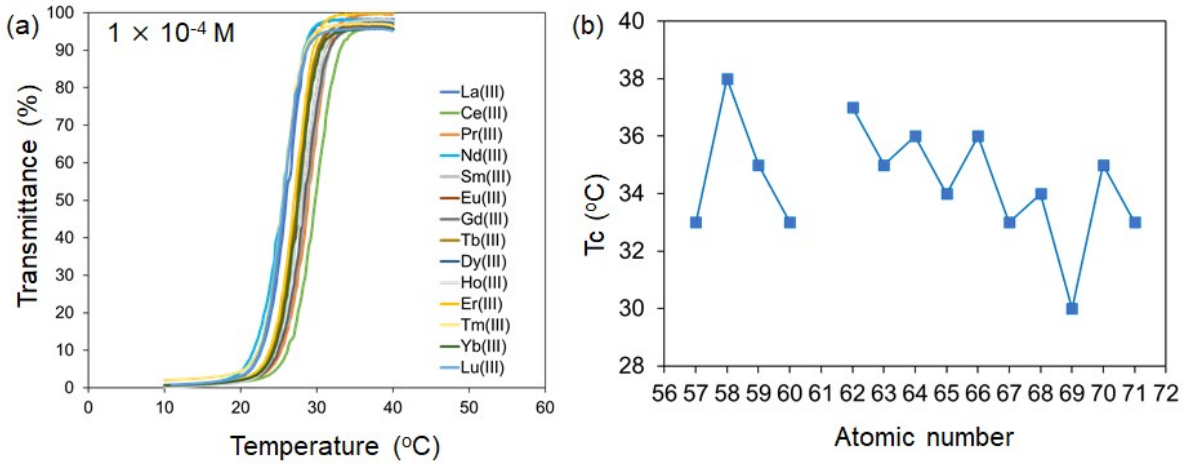


Figure S4. (a) Temperature dependence of optical-transmittance plots for the poly(DMAPS) in all Ln ions (1×10^{-4} M) and (b) the Ln atomic number dependence of the UCST.

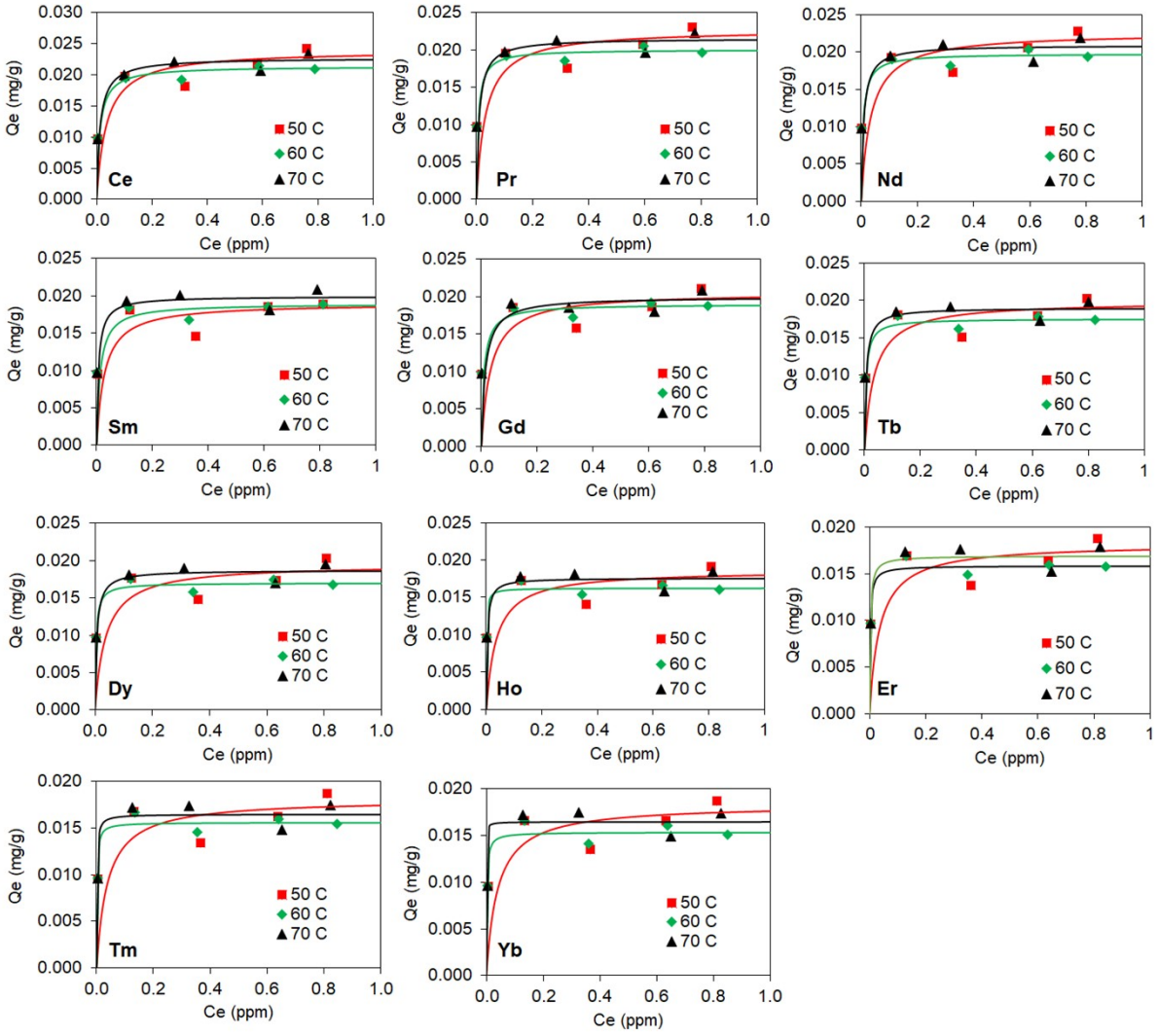


Figure S5. Effects of initial concentrations on all Ln(III) except La, Eu, and Lu at 50 – 70 °C, respectively.

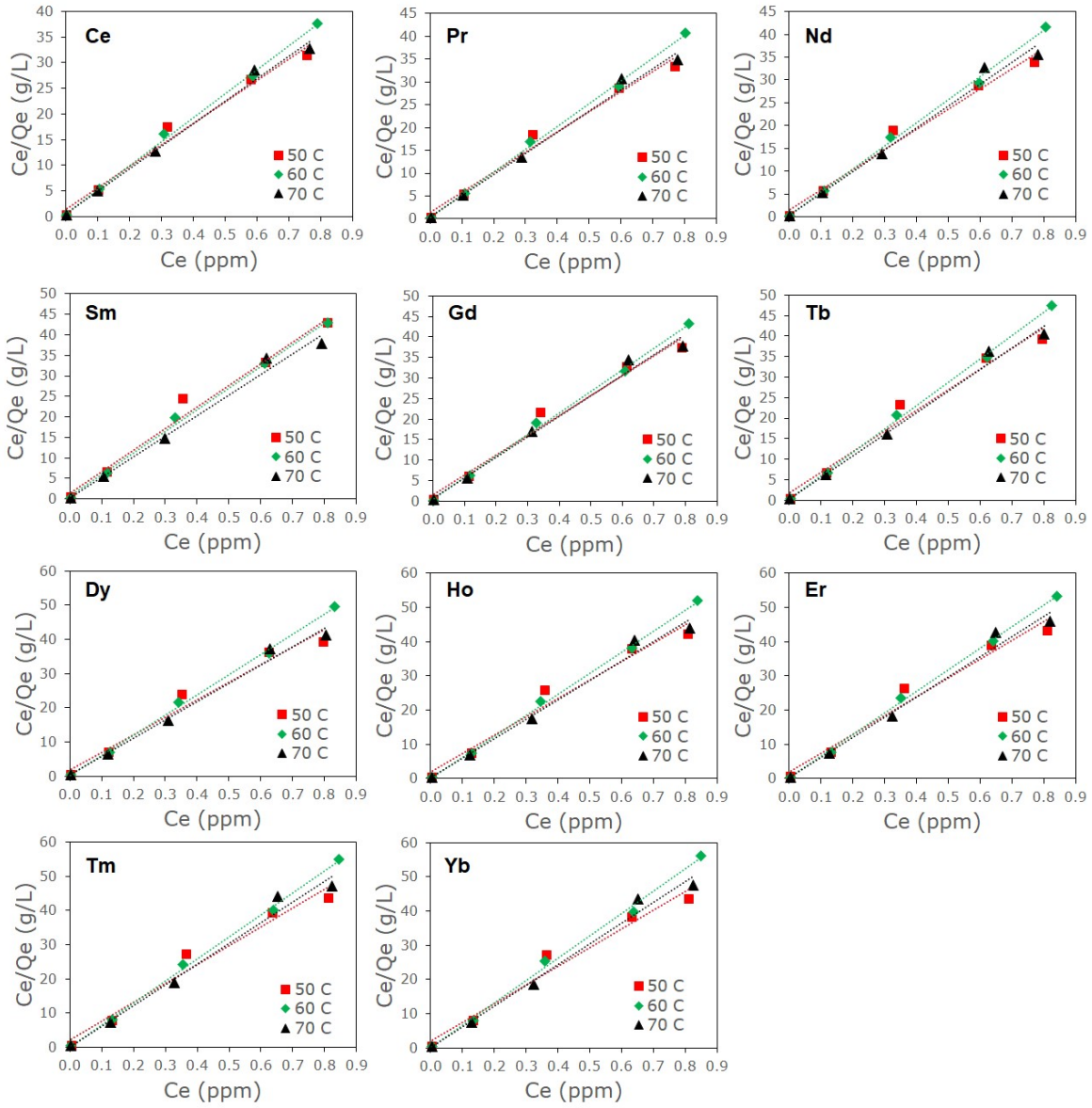


Figure S6. Linear regression analysis based on Langmuir adsorption isotherm model fittings for all Ln(III) except La, Eu, and Lu at 50 – 70 °C.

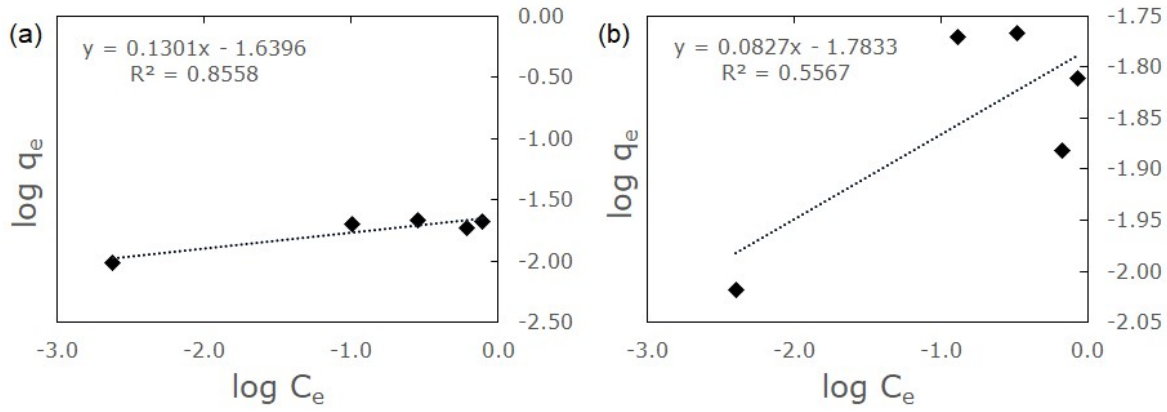


Figure S7. Freundlich isotherm model fittings for (a) La and (b) Lu ions, respectively.

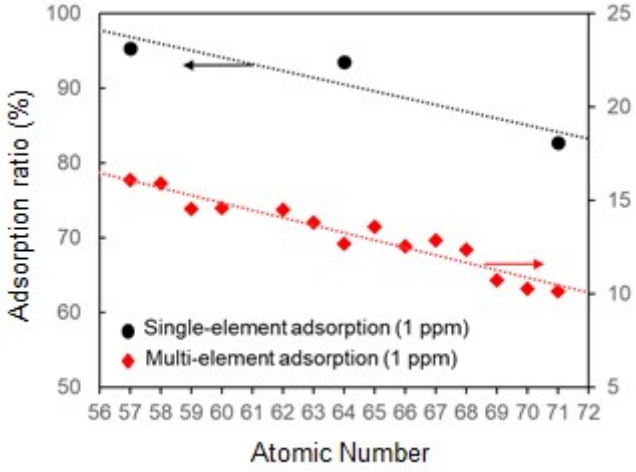


Figure S8. Adsorption ratios of Ln ions in single- and multi-elemental solutions.

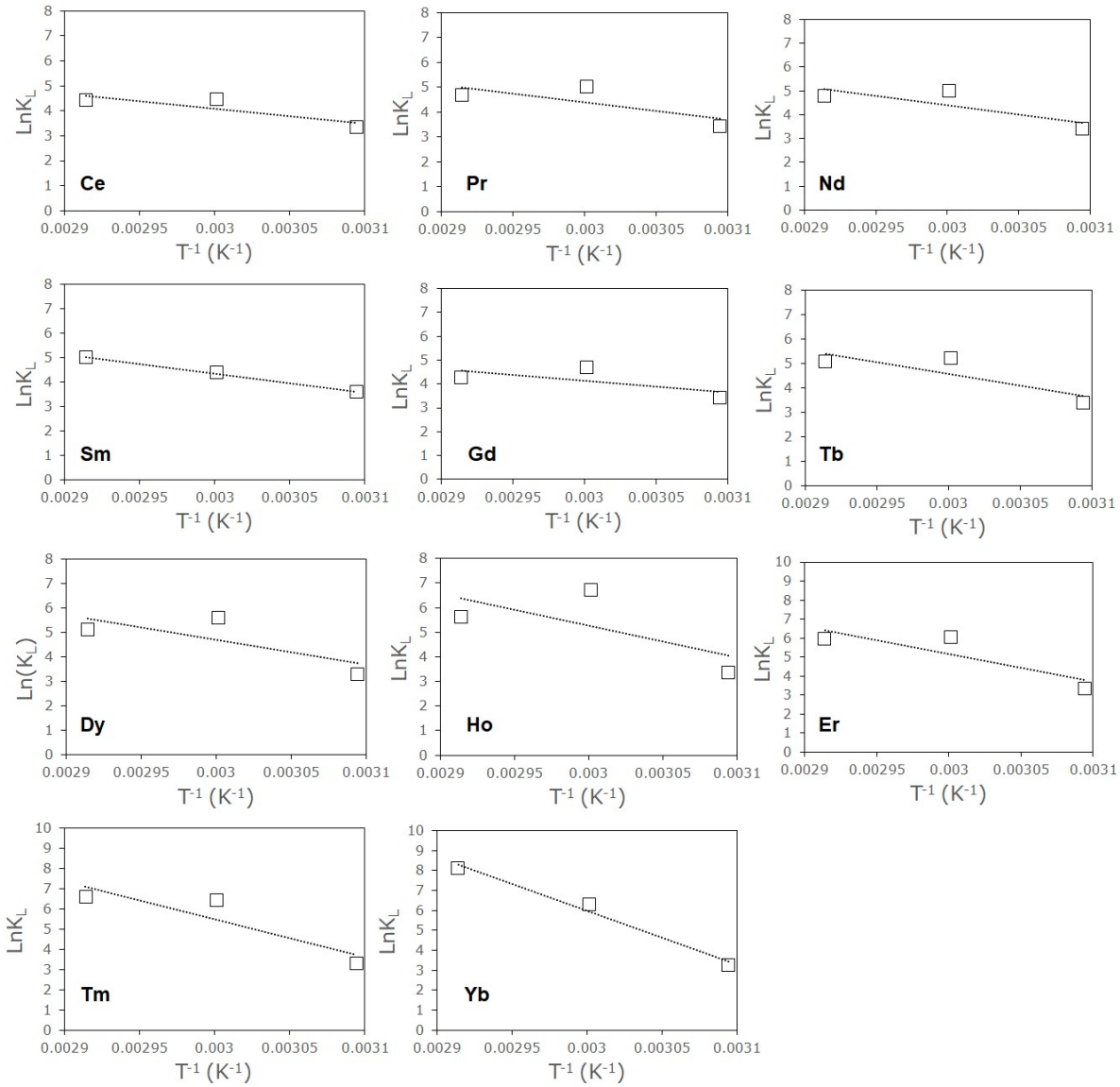


Figure S9. The plots of LnK_L vs. 1/T (van't Hoff plot) of all Ln(III) except La, Eu, and Lu.

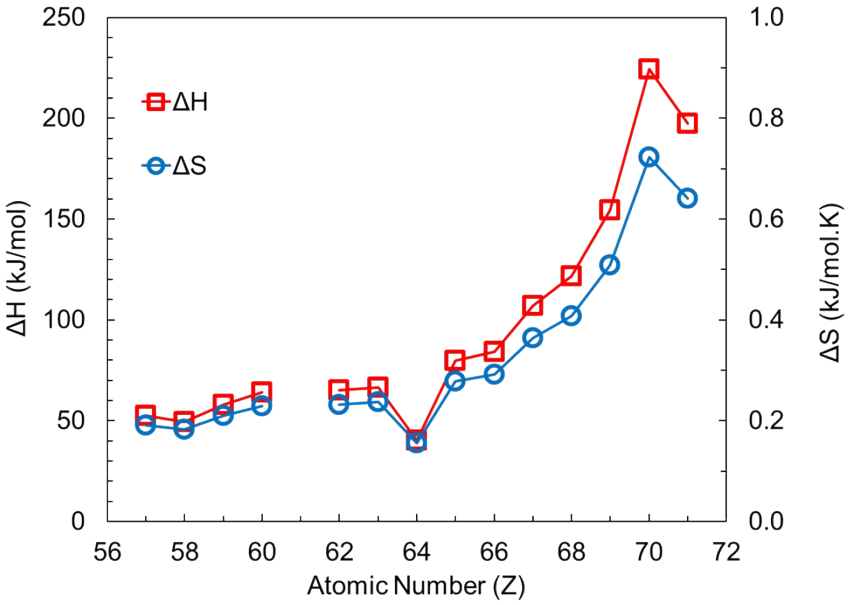


Figure S10. Atomic number dependence of standard enthalpy change (ΔH^o) and standard entropy change (ΔS^o) for all Ln ions.