

Figures:

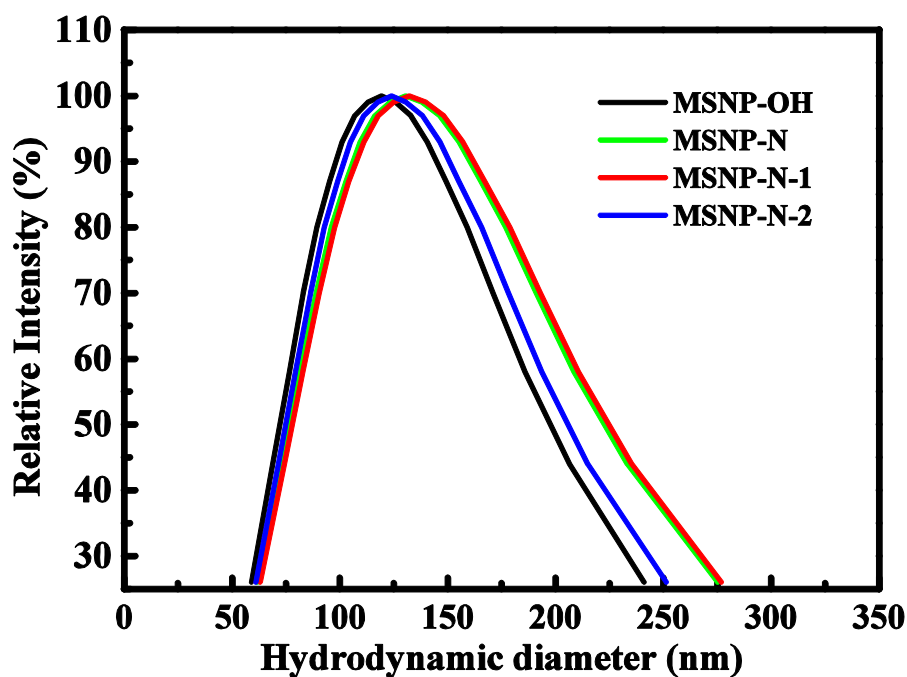


Fig. S1. Hydrodynamic diameter distributions of MSNP-OH, MSNP-N, MSNP-N-1, and MSNP-N-2 in water. All particles were suspended at a concentration of 100 $\mu\text{g/mL}$.

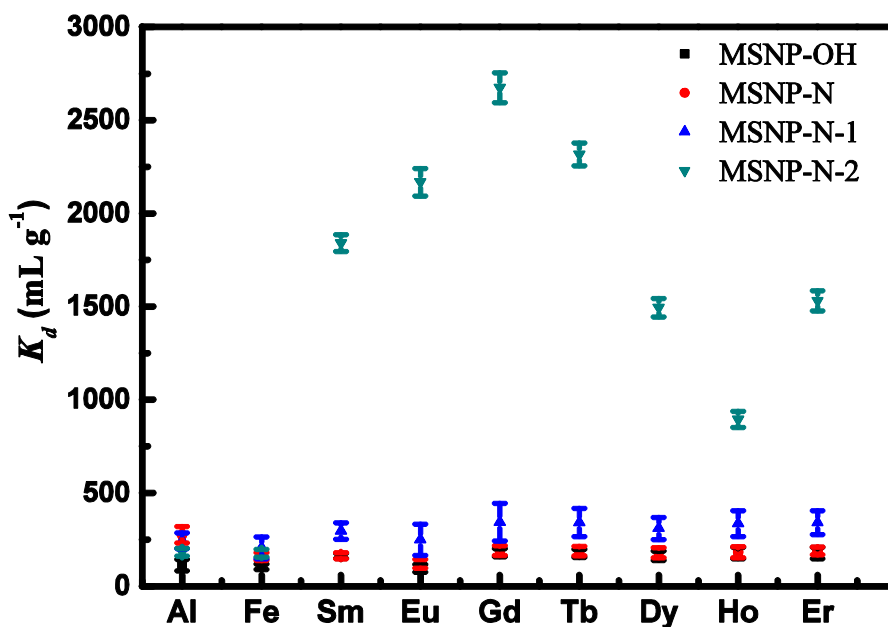


Fig. S2. K_d values of the hybrid materials for a mixture of Al, Fe, Sm, Eu, Gd, Tb, Dy, Ho, and Er. Error bars represent the standard derivation.

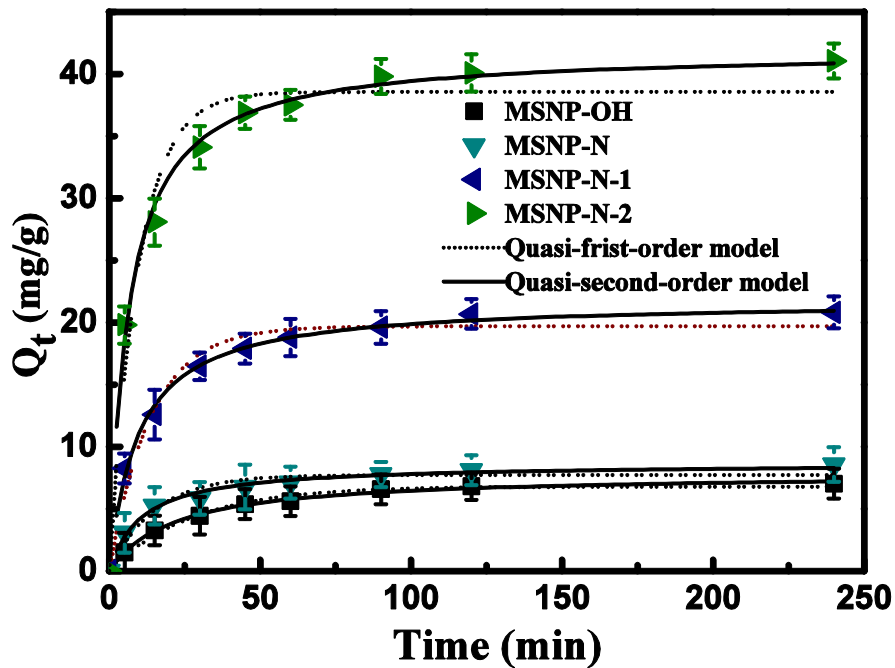


Fig. S3. Kinetic data and modelling for the adsorption of Gd³⁺ on MSNP-OH, MSNP-N, MSNP-N-1, and MSNP-N-2. Error bars represent the standard derivation.

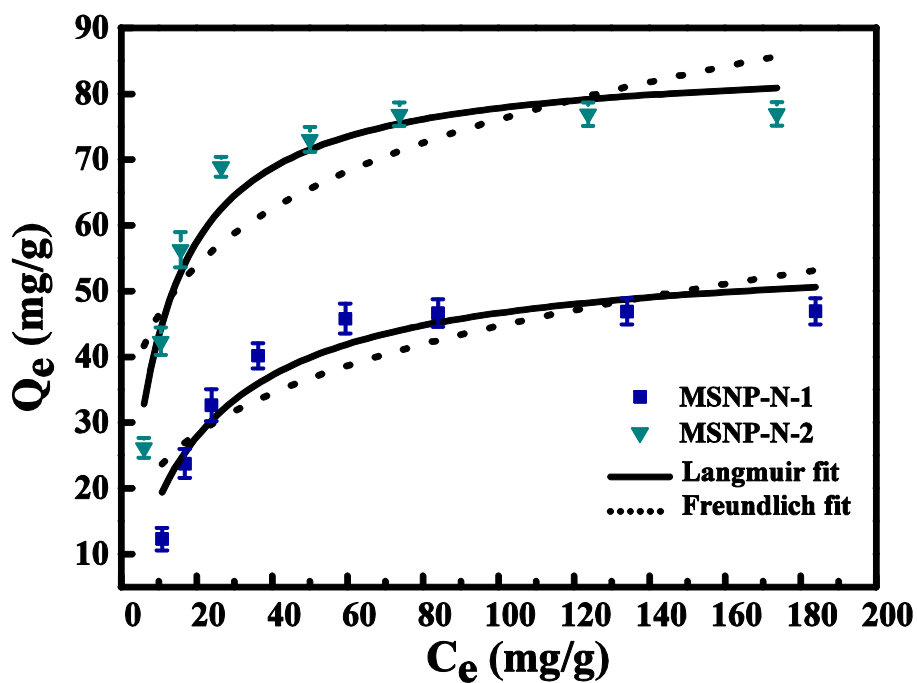


Fig. S4. Equilibrium data and modelling for the adsorption of Gd³⁺ on MSNP-OH, MSNP-N, MSNP-N-1, and MSNP-N-2. Error bars represent the standard derivation.

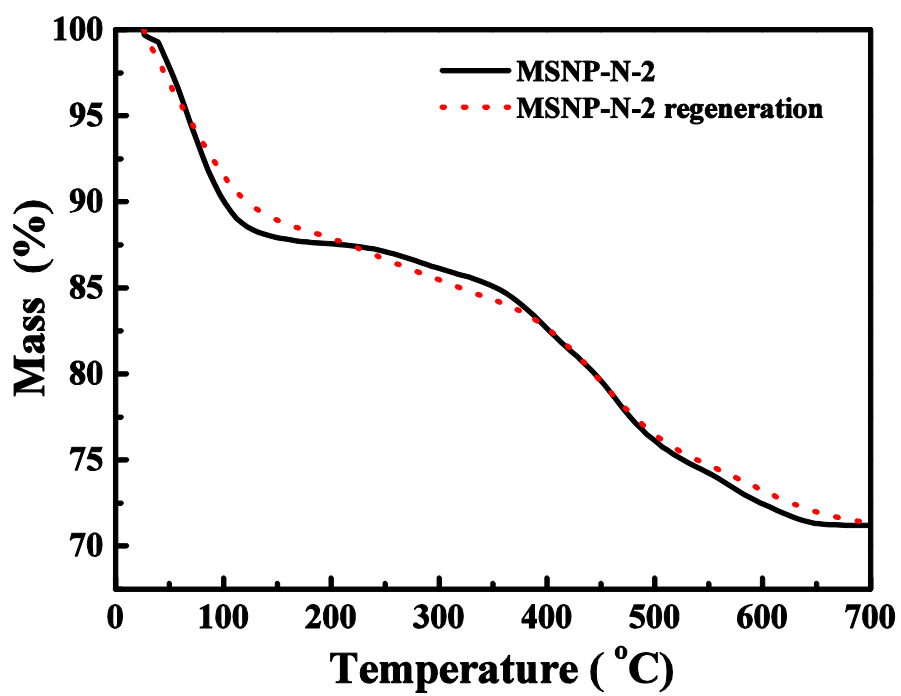


Fig. S5. TGA analysis for MSNP-N-2 before and after the regeneration tests.