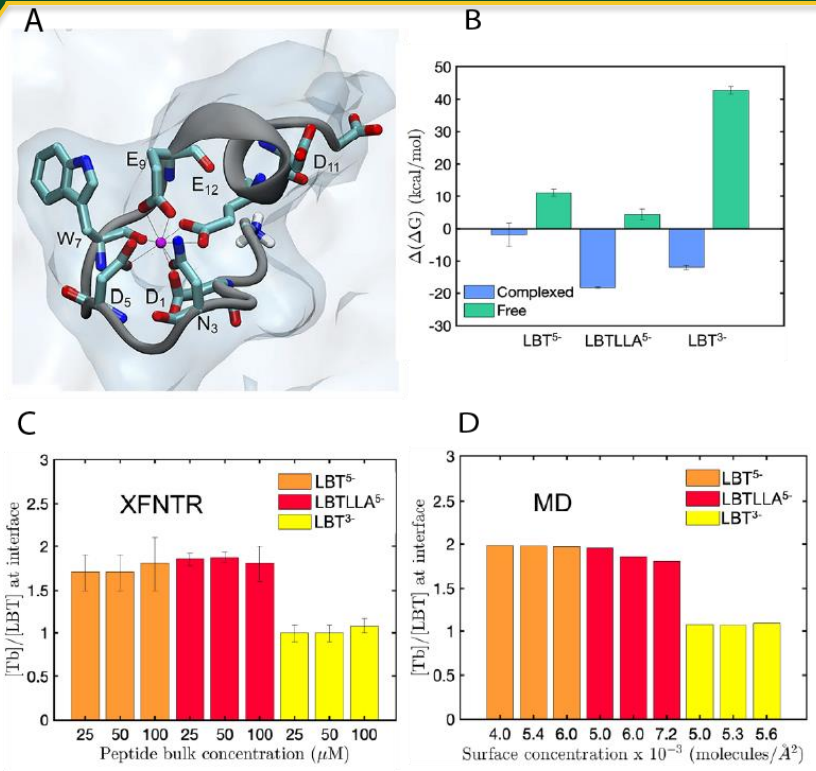
Eco-friendly rare earth element separation method



(A) structure of LBT^{5-} complexed with Tb^{3+} illustrating the coordination to the cation. (B) MD free energy of adsorption of peptides to the air–aqueous interface from a bulk aqueous solution. Number of Tb3+ per LBT peptide in the interfacial zone (C) FTIR and (D) MD.

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Scientific Achievement

We design surface active peptides (LBTs) that selectively bind rare earth element cations in solution and transport them to the air/water interface.

Significance and Impact

The selective separation of rare earth elements (REEs) is critical for numerous technologies, including modern electronics and clean, sustainable energy technologies. Current separation methods are neither sustainable nor efficient. Our findings suggest new avenues for designing energy-efficient, all-aqueous, green, interfacial REEs separation processes.

Research Details

- The peptides' design parameters are evaluated using molecular dynamics simulations, including the LBT-cation binding coordination and stability, the free energy of adsorption (free and complex), and the cation interfacial adsorption.
- Our experimental measurements show that the LBTs peptides capture Tb^{3+} in bulk and adsorb as a complex to the interface.