Anion Binding and Sensing with Luminescent Lanthanide Probes

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The design of molecular probes that selectively bind and sense anions in aqueous media is a key challenge in supramolecular chemistry. The ability to distinguish between biological phosphate anions (*e.g.* ATP, ADP, AMP) will underpin exciting new sensing tools for biological, clinical and drug discovery research. However, this is very challenging due to similarities in anion structure, size and charge. Luminescent lanthanide probes, particularly of europium(III) and terbium(III), offer unique photophysical properties that are very valuable for sensing and imaging in biological media. However, only a small number of lanthanide probes have been developed that exhibit sufficiently high anion selectivity to be utilised in biological applications.

I will present our progress in the development of lanthanide probes, which utilise macrocyclic ligands functionalised with multiple recognition motifs. These probes are capable of recognising target phosphate species with high selectivity and sensitivity in 100% aqueous media.[1-5] We have established key design principles to create lanthanide complexes that engage their anionic target through a combination of metal-ligand coordination, hydrogen bonding and reversible boronate formation (Figure 1). I will discuss our efforts to translate these selective lanthanide probes into improved bioassays and cellular imaging tools. By doing so, we aim to drive advancements in biomedical research and expedite drug discovery efforts.

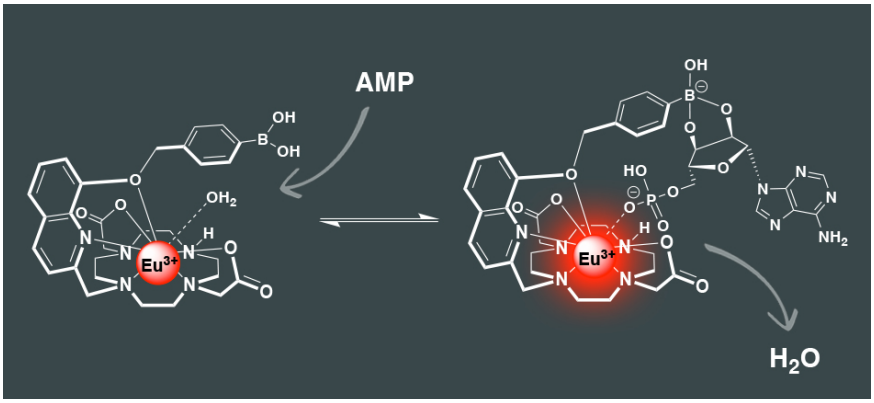

Figure 1. Macrocyclic europium(III) complex designed for multisite recognition of adenosine monophosphate (AMP), producing intense and long-lived red emission.

References

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