Facilitating single-stranded nucleic acid poly(dA) and poly(rA) self-structured by a europium and amino acid complex

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Lanthanide materials have been widely used as probes in luminescent resonance energy transfer (LRET) for bioassays and as reagents for diagnosis in magnetic resonance imaging (MRI). As chemical nucleases, lanthanide complexes have also shown a high efficiency to hydrolyze DNA and RNA without redox chemistry. We are reporting the synthesis and crystal structure of $[Eu_8(L\text{-}Val)_{16}(H_2O)_{32}]Cl_{24}$ at physiological pH 7.0. Unexpected DNA and RNA selection results showed that the complex can cause single-stranded ploy(dA) and poly(rA) to self-structure rather than to cleave. The sigmoidal melting curve profile at 46^oC indicates the transition is cooperative, similar to the cooperative melting of a duplex DNA. To the best of our knowledge, we are reporting for the first time that a lanthanide-amino acid complex can cause the self-structuring of single-stranded DNA and RNA. We thank Professors Harry B. Gray (Caltech), Jiazuan Ni and Chunji Niu for their help comments and suggestions on this research. This work was supported by key project fund and distinguished young scholar fund from NSFC (20225102, 20331020 and 20473084), and hundred people program from CAS.