Structures and spectral and magnetic properties of a series of carbacylamidophosphate pentanuclear lanthanide(III) hydroxo complexes.

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A series of pentanuclear lanthanide complexes $Ln_5L_6(\mu\text{-}L)_4(\mu_3\text{-}OH)_4(\mu_4\text{-}OH)$ (Ln^{III} = Nd, Dy, Ho, Er, Yb; L^- = dimethyl *N*-benzoylamidophosphate ion, $[C_6H_5C(O)–N–P(O)(OCH_3)_2]^-$) was obtained by the reaction of sodium dimethyl *N*-benzoylamidophosphate with the corresponding lanthanide nitrates. The pentanuclear cores formed as a result of self-arrangement and their composition did not depend on the lanthanide ion. The complexes and sodium dimethyl *N*-benzoylamidophosphate have been characterized by single-crystal X-ray diffraction. The absorption spectra of the complexes were measured at 300 and 4 K. The dysprosium and ytterbium complexes exhibited weak emission in the visible and IR regions, respectively. Temperature dependences of magnetic susceptibility (χ_M) of the dysprosium, holmium, and erbium compounds were studied. It was found that χ_M vs T dependences were governed by the crystal field splitting effects with the Δ parameter being in the range 5–17 cm^{-1}. Slow magnetic relaxation was found for the dysprosium complex by ac magnetic measurements, while no significant out-of-phase signals were detected for holmium and erbium complexes.

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