

Thermal properties of heterometallic Fe(III)-Ln(III) carboxylate wheels and clusters

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Thermogravimetric analysis (TGA) has been widely used for the characterization of a wide variety of materials, including coordination cluster compounds. TGA study provides valuable information about compounds such as their thermal stability and composition, influence of temperature on the structure and its transformation, give information regarding intermediate and final product and the way of decomposition.

Thermal properties of heterometallic decanuclear wheels $[\text{Fe}_6\text{M}_4(\text{is})_8(\text{N}_3)_2(\text{bdea})_{10}]\cdot\text{MeOH}$ (where M = Dy (1), Gd (2), Tb (3), Ho (4), Y (5)), His = isobutyric acid; bdeaH₂ = butyldiethanolamine) (Figure 1a) and hexanuclear clusters $[\text{Fe}_4\text{M}_2(\mu_3\text{-OH})_2(\text{is})_6(\text{N}_3)_2(\text{bdea})_4]\cdot\text{MeOH}$ (where M = Dy (6), Gd (7), Tb (8), Er (9), Y (10), Tm (11)) (Figure 1b) have been investigated by TGA/DTA measurements. Single-crystal X-ray analysis showed that wheels 1-5 are isostructural and crystallize in the triclinic space group *P*-1, while isostructural clusters 6-11 crystallize in the orthorhombic space group *Pbca*. Thermogravimetric studies of compounds have been performed from 25 to 800°C with a heating rate of 5 min⁻¹ under nitrogen atmosphere. TGA diagrams display that molecular wheels 1-5 remain stable before the temperature of 220°C and clusters 6-11 up to 150°C. The loss of methanol solvent molecules of all compounds took place in the range of 50-100°C. The decomposition of the organic components occurs in the range of 220 - 550 °C for 1-5 and 150 - 500°C for 6-11, giving the residual weight suggests the final product of iron and lanthanide oxides. Both series show three-step decomposition accompanied by an exothermic (1-5) and an endothermic peak (6-11). TGA studies revealed that coordination wheels 1-5 are thermally more stable than clusters 6-11.

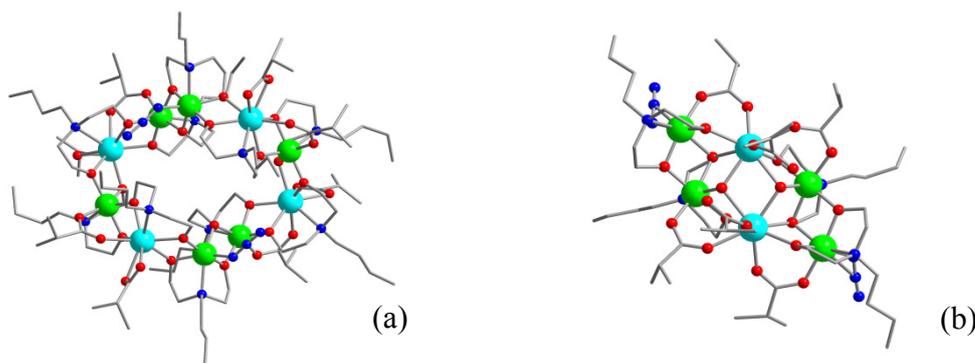


Fig. 1. Molecular structure of 1-5 (a) and 6-11 (b). Colour definition: Fe, light green; Ln, aqua; O, red; N, blue balls and C, grey sticks. Hydrogen atoms are omitted.

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