Thermal decomposition of heavy rare-earth butanoates, Ln(C₃H₇CO₂)₃ (Ln = Er, Tm, Yb and Lu) in argon

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The thermal behaviour of Ln(C₃H₇CO₂)₃ (Ln = Er, Tm, Yb or Lu) was studied in argon from room temperature by means of thermogravimetry and differential thermal analysis up to 1400 °C, by infrared spectroscopy, hot-stage optical microscopy and X-ray diffraction. Melting prior to decomposition was observed in all four compounds, but its course depends on the rare-earth element. Decomposition to sesquioxides proceeds via the formation of dioxymonocarbonates (Ln₂O₂CO₃) and release of 4-heptanone (C₃H₇COC₃H₇) as well as carbon dioxide (CO₂) without evidence for an intermediate oxobutanoate stage. During the decomposition of Ln₂O₂CO₃ into the respective sesquioxides (Ln₂O₃), an intermediate plateau extending from approximately 550 to 850 °C appears in the TG traces. The overall composition during this stage corresponds approximately to Ln₂O₂.₈(CO₃)₀.₂, but the state is more probably a mixture of Ln₂O₂CO₃ and Ln₂O₃. The stability of this intermediate state seems to decrease with the mass of the rare-earth elements. Complete conversion to Ln₂O₃ is reached at about 1100 °C. The overall thermal decomposition behaviour of the title compounds is different from previous reports for other rare-earth butanoates.

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