Thermal behavior and characterization of trivalent europium mefenamate complex in air atmosphere

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Abstract

The association AINE`s with metals have been used as new materials to large applications. The compound $Eu(Mef)_3$ was synthetized in solid-state, where Eu is trivalent europium and Mef is the mefenamate ($C_{15}H_{14}NO_2^-$). The thermal behavior and DRX analysis indicated low cristallinity and thermal stability up 290ºC. The evolved gases during thermal decomposition at air atmosphere are lower toxicity.

Introduction

Lanthanides complexes have interesting properties as luminescent sensors[1], electroluminescent material[2] and magnetic material[3]. The compound was prepared following the methodology already described[4]. The characterization of the compound was performed using complexometry, elemental analysis (Perkin Elmer, model 2400), X-ray powder diffractometry (Bruker AXS D8 Advance), simultaneous thermogravimetry and differential scanning calorimetry (TG-DSC) (obtained using a STARe software and thermogravimetric analyzer system from Mettler-Toledo), TG-DSC coupled to infrared spectroscopy (Mettler TG-DSC to a FTIR Nicolet spectrophotometer).

Results and Discussion

The analytical and thermoanalytical (TG) results, see table 1, permitted to establish the stoichiometry, with the general formula of the $Eu(Mef)_3$. The TG-DSC curves of the synthesized compound show that the thermal stability up 290 ºC. The thermal decomposition of compound in air atmosphere occured in three steps, 1st (290 ºC - 390 ºC), 2nd (390 ºC - 470 ºC) and 3rd (470 ºC - 610 ºC), see Fig. 1(a). The first two mass losses occur through a fast process corresponding to exothermic peaks at 368 ºC and 456 ºC attributed to oxidation of the organic matter with the formation of carbonaceous residue plus a derivative of europium carbonate, probably europium oxicarbonate. The last mass loss, that occurs slowly, corresponding to small and broad exothermic event or without thermal event is attributed to oxidation of the carbonaceous residue and thermal decomposition of europium carbonate with the formation of the respective oxide, Eu_2O_3. The X-ray powder patterns show that the compound was obtained with low crystallinity state, see Fig. 1(b). CO_2, CO, 2,3-dimethyl-N-phenylaniline and NH_3 were detected as evolved gas analysis during the thermal decomposition.

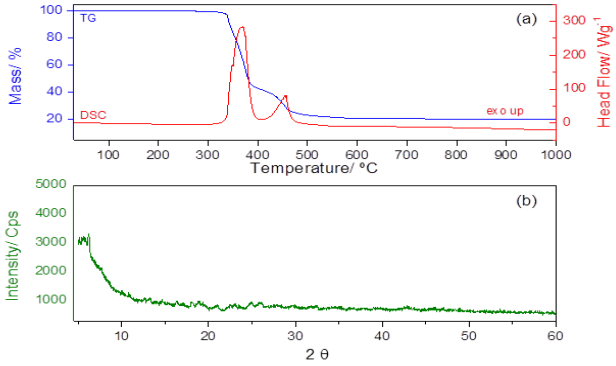

Fig. 1. (a) TG-DSC; (b) DRX.

Table 1. Analytical and thermoanalytical (TG) results.

	Calc.	TG	EDTA
Eu_2O_3/ %	20.16	20.43	20.02
Mef (loss)/ %	79.84	79.57	----
	Calc.	**TG**	**EA**
C/ %	61.91	61.70	62.27
H/ %	5.09	5.07	4.83
N/ %	4.81	4.79	5.12

Conclusions

The general formula of the compound was determined. The Thermal analysis data provided previously unreported information about the thermal behavior. The main gaseous were determined from EGA. The compound was obtained with low crystallinity state.

Acknowledgements

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