



Luminescent properties of europium carboxylates



I.V. Kalinovskaya ^{a,*}, A.N. Zadorozhnaya ^b, Yu.M. Nikolenko ^a

^a Institute of Chemistry Far Eastern Branch of Russian Academy of Science, Prosp. 100-letya Vladivostoka, 159, Vladivostok, Russia

^b Pacific State University of Medicine, 2a, Prosp. Ostryakova, Vladivostok 690002, Russia

ARTICLE INFO

Article history:

Received 26 May 2015

Received in revised form

9 July 2015

Accepted 17 July 2015

Available online 20 July 2015

Keywords:

Luminescence

Europium

Carboxylates

XPS

ABSTRACT

Mixed-ligand europium carboxylates with nitrogen- and phosphorus-containing neutral ligands having polymer or island structure were studied by the luminescent and X-ray photoelectron spectroscopy methods. In similar groups of the compounds, the value of Stark splitting of the 7F_1 – level decreased with decrease of the electron density transfer from europium ion to ligand (covalence of metal-ligand bond increases) and the relative intensity of electro-dipole ${}^5D_0 - {}^7F_4$ transition rised.

© 2015 Elsevier B.V. All rights reserved.

1. Introduction

Such properties of the lanthanide compounds at tendency to complexing and sublimation, ability to intensive absorption and luminescence depend directly on the lanthanide electron structure and the nature of the chemical bond in the mixed-ligand complexes. It is known that substitutes, even distant from reaction centers of ligand molecules, change distribution of the electron density in these molecules and therefore influence on the physico-chemical and analytical properties of the compounds: strength of Ln-ligand bond, its character, and optic characteristics of the compounds. The change of the atom change may be a measure of the change of electron distribution [1–5].

For an accurate estimation of influence of the nature of the environmental on the spectral – luminescence properties of the

rare-earth complexes one should have knowledge on peculiarities of their electron structure. Wide use of the lanthanide compounds [6,7] is a cause of increased interest to study of their electron structure nature of chemical bond.

The literature analysis testifies to insufficient investigation of correlation of the Ln^{3+} luminescent parameters with the characteristics of its electron structure determined by the photo- and X-ray electron spectroscopy methods [1–3,8–10]. The mixed-ligand europium(III) compound with β -diketones were studied by the luminescent and X-ray spectroscopy methods [11,12] while the rare-earth compounds with carboxylic acids were not practically investigated [13,14].

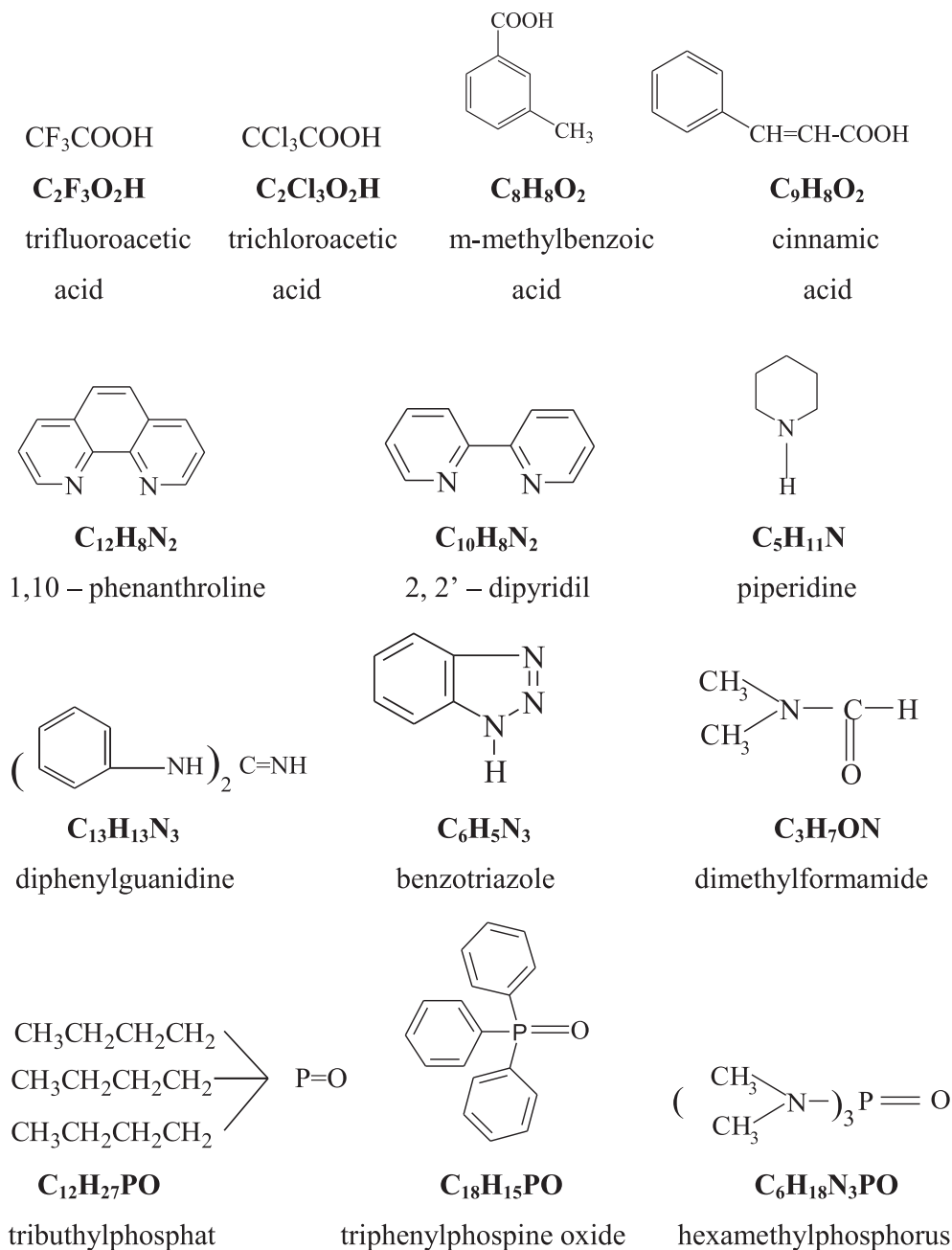
2. Experimental

2.1. Materials

For synthesis of the compounds the following reagents were used:

* Corresponding author.

E-mail address: kalinovskaya@ich.dvo.ru (I.V. Kalinovskaya).



2.2. Synthesis

Europium complexes were obtained by interaction of europium trifluoroacetate and trichloroacetate hydrates and neutral ligand (in the 1: 2 M ratio). Mixed-ligand compounds with meta-methylbenzoic and cinnamic acids were prepared by interaction of a europium salt, sodium salt of the acid, and a neutral ligand (in the molar ratio 1: 3: 2). The method was described in detail in Refs. [15–17].

2.3. Chemical elemental analysis

The elemental contents of complexes were measured with

EURO EA 3000.

2.4. Luminescence measurements

The luminescence spectra were registered on a SDL-1 diffraction spectrometer at 300 K and 77 K. The resolution of the diffraction spectrometer ~1 nm. In order to estimate intensity of luminescence we carried out integration of the areas of the luminescence bands which positions were determined to an approximation of $\pm 2\text{--}3\text{ cm}^{-1}$.

The luminescence excitation spectra were recorded on the installation assembled on the basis of a SDL-1 spectrometer and a MPD-23 monochromator; a Tunggram 2500 W xenon lamp served

Download English Version:

<https://daneshyari.com/en/article/1407997>

Download Persian Version:

<https://daneshyari.com/article/1407997>

[Daneshyari.com](https://daneshyari.com)