

Absorption Spectra of the 4f Electron Transitions of the Nd, Ho and Er Complexes with 1-Cyclopropyl-6-fluoro-1,4-dihydro-7-(4-ethyl-1-piperazinyl)-4-oxo-3-quinoline Carboxylic Acid Hydrochloride in the Presence of TX-100

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Abstract: The absorption spectra of the neodymium, holmium and erbium complexes with 1-cyclopropyl-6-fluoro-1,4-dihydro-7-(4-ethyl-1-piperazinyl)-4-oxo-3-quinoline carboxylic acid hydrochloride in the presence of TX-100 have been shown. The characteristic absorption bands of the 4f electron transitions of the complexes are enhanced markedly.

Keywords: Hypersensitive phenomenon, lanthanide.

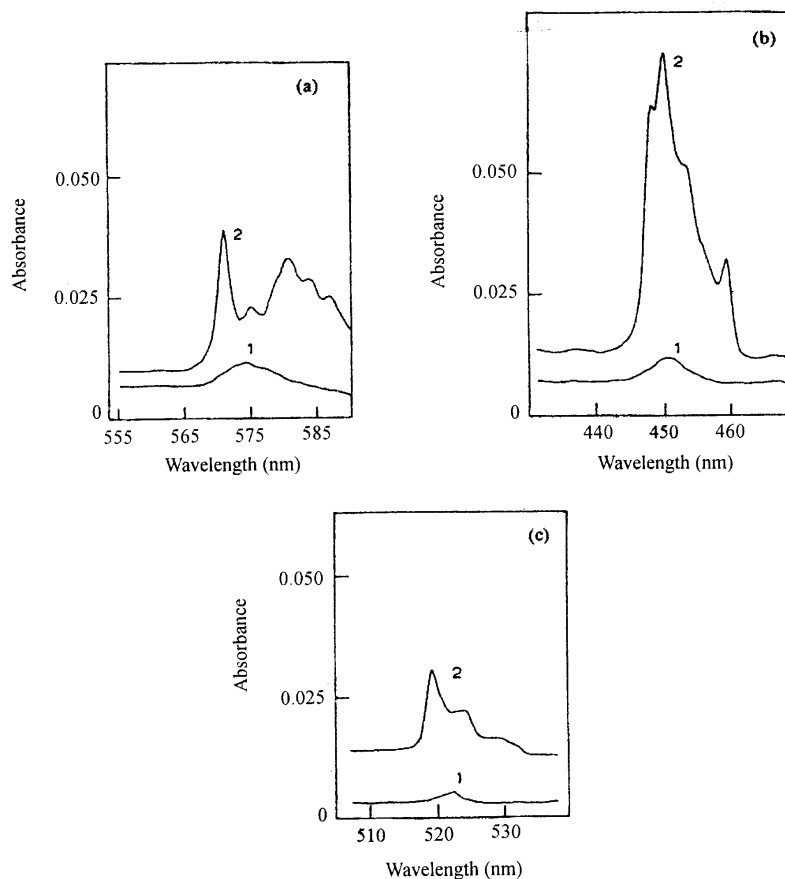
The tripositive rare earth metal ions show comparatively little tendencies to form complexes with a variety of normally powerful coordinating agents due to their peculiar electronic configurations. However, certain chelating groups, notably the β -diketones^{1,2} and 8-quinolinols^{3,4}, are capable of overcoming this difficulty through the formation of inner complex compounds.

1-Cyclopropyl-6-fluoro-1,4-dihydro-7-(4-ethyl-1-piperazinyl)-4-oxo-3-quinoline carboxylic acid hydrochloride (NNFX), is one of the 4-quinoline synthetic antibiotics. All quinolines possess a carboxylic acid moiety and the carboxyl group which were required for antimicrobial activity and also thought to be a site of chelation interaction with various cations. It has been used for determination (or study) of some transition metal elements, but not yet used for study of the 4f electron transitions spectra of the rare earths metals. We found that the absorption spectra of the 4f electron transitions of neodymium, holmium and erbium complexes with NNFX in the presence of TX-100 are enhanced markedly. On this basis, the spectral characteristics of the system were described. **Figure 1** showed that the absorption spectra of the lanthanide ions and their complexes. From which one can observed absorption band at 575 nm for Nd, 450 nm for Ho and 523 nm for Er respectively. However, when these metals coordinated with NNFX in the presence of TX-100 every band was separated into three sharp bands (571, 580 and 584 nm for Nd, 449,452 and 460 nm for Ho, 519, 523 and 525 nm for Er). Their molar absorptivities at the maximum absorption bands are about 5.3 (at 571 nm) times greater for neodymium, 11.5 (at 449 nm) times greater for holmium and 8.4 (at 519 nm) times greater for erbium than metals themselves. Changes of the intensities and the peak's shape of the complexes can be explained that coordination field of the ligand (or

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environment) surrounding the rare earth ions was increased. The absorption bands

Figure 1 Absorption spectra of the lanthanide ions and complexes
(a): Neodymium; (b): Holmium; (c): Erbium.



Curves: 1, LnCl_3 ; 2, Ln^{3+} -NNFX-TX-100.

involved transition from the ground state $^4I_{9/2}$ of neodymium ion to the $^2G_{7/2}$, $^4G_{5/2}$ excited state; the ground state 5I_8 of holmium ion to the 5G_6 excited state; the ground state $^4I_{15/2}$ of erbium ion to the $^2H_{11/2}$ excited state, in the results narrow, relatively intense bands were given.

The experimental results confirmed that the non-ionic and cationic surfactants, all enhance the 4f electron transitions of the complexes. The Triton-100 (TX-100) was selected because the better spectral characteristics of the complexes could be obtained in its presence.

References

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