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Analytica Chimica Acta

journal homepage: www.elsevier.com/locate/aca

Determination of fluoroquinolone antibiotics through the fluorescent response of Eu(III) based nanoparticles fabricated by layer-by-layer technique



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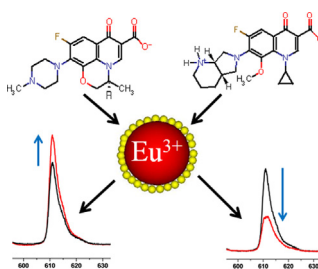
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HIGHLIGHTS

- Novel route of fluorescent determination of fluoroquinolones was developed.
- Fluorescent response arises from ligand exchange in Eu(III) based colloids.
- Fluorescent response is affected by concentration and structure of fluoroquinolones.
- Conditions of discrimination between fluoroquinolones are revealed.

GRAPHICAL ABSTRACT



ARTICLE INFO

Article history:

Received 29 November 2012

Received in revised form 26 April 2013

Accepted 29 April 2013

Available online 9 May 2013

Keywords:

Fluoroquinolones
Luminescence
Europium(III)
Nanoparticles
Capsules
Layer-by-layer

ABSTRACT

The present work introduces the determination of fluoroquinolone antibiotics (FQs) in aqueous solution through the fluorescent response of $\text{Eu}(\text{TТА})_3$ and $[\text{Eu}(\text{TТА})_3\mathbf{1}]$ (TТА^- and $\mathbf{1}$ are thenoyltrifluoroacetone and phosphine oxide derivative) complexes encapsulated into the polyelectrolyte capsules fabricated through layer-by-layer deposition of poly(sodium 4-styrenesulfonate) (PSS) and polyethylenimine (PEI). The variation of luminescent core, polyelectrolyte deposition and concentration conditions reveals two modes of fluorescent response on FQs of diverse structure namely the sensitization and quenching of $\text{Eu}(\text{III})$ centered luminescence. The obtained regularities reveal the ternary complex formation and ligand exchange occurring at the interface of polyelectrolyte coated $[\text{Eu}(\text{TТА})_3\mathbf{1}]$ based colloids as reasons of the diverse fluorescent response of $\text{Eu}(\text{III})$ centered luminescence on FQs. The factors affecting the fluorescent response have been revealed, which are: the content of luminescent core, the mode of polyelectrolyte deposition, concentration and structure of FQs. The discrimination of moxifloxacin and lomefloxacin from levofloxacin, ofloxacin, difloxacin, perfloroxacin through the quenching of $\text{Eu}(\text{III})$ luminescence in PSS- $[\text{Eu}(\text{TТА})_3\mathbf{1}]$ colloids has been revealed.

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1. Introduction

The luminescent lanthanide complexes are a top of current research interest during recent decades due to their technological, analytical and medical application [1–8]. The applicability of lanthanide complexes in biosensing is well documented in literature [5–10].

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