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A PHOTOPHYSICAL INVESTIGATION OF LANTHANIDE COMPLEXES BASED ON LEVOFLOXACIN

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Antibiotics hold potential for future applications in cancer treatment, with certain types of tumors being targeted. Levofloxacin is a notable example that has been widely investigated for its anti-tumor activity. To improve its therapeutic performance, it has been employed as a ligand in coordination complexes with metal ions. Levofloxacin and its derivative compounds have gained significant attention due to their luminescent properties. Thus, this organic compound could be used as antenna in coordination complexes to combine its antibiotic properties with the superior luminescence properties of lanthanide ions, which make levofloxacin complexes particularly appealing for probing biological environments.

This work is focused on studying electronic and photophysical properties of levofloxacin and its coordination compounds with the metallic ion Zn(II) and the lanthanide ions Tb(III) and Eu(III) experimentally and theoretically. In the solid-state, hydrogen bonds between levofloxacin molecules from different units stabilize the overall structure. In solution and solid state, the emission spectra of levofloxacin and its Zn(II) coordination complex show the same profile. However, the emission spectra of its Tb(III) and Eu(III) coordination complexes in both phases display the evident narrow lanthanide emission spectra, indicative of a clear antenna effect. This is also clearly observed when the complexes form in a cellular environment, confirming the feasibility of studying their localization and monitoring their activity as drugs using bioimaging techniques. We also report a detailed photophysical and Time-Dependent Density Functional Theory (TD-DFT) computational investigation that unveils antenna effect's performance and the different sensitization pathways involved.

Keywords

Hydrogen bond: medium; State of system: solution, solid; levofloxacin; photophysics; cellular environment

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