

Photonics of azo-substituted dipyrromethene complexes with p- and d-elements

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Study of complexes of dipyrromethene with different structure is one of the most successfully developing areas of modern chemistry. The demand for using a variety of optical devices in modern technology makes it necessary to explore the photonics of new organic luminophores (coordination complexes of dipyrromethene with p- and d-elements) depending on their structure, intermolecular interactions, temperature, etc. The most perspective members of this family are boron fluorinated complexes of dipyrromethene (BODIPY). Derivatives of complexes of dipyrromethene with p-(B(III)) and d-(Zn(II)) elements have unique photochemical characteristics. Systematic observation of lasing, photochemical and photophysical properties and establishment of their connection with structural features of the complexes are required for successful usage of dipyrromethene complexes and creation of various hi-tech optical devices which are based on them. It is the main objective of this work. Spectral-luminescent properties were studied by methods of electron and luminescent spectroscopy and photochemical characteristics were found by using laser excitation sources.

According to experimental data aza-substituted boron fluoride complexes are characterized by high dipyrromethene absorption (642-648 nm) and inefficient fluorescence (671-674 nm), due to the effect of "heavy" atoms, which are increasing intersystem crossing. When replacing the central atom boron (III) with zinc (II), the fluorescence disappears, presumably due to the increase of non-planarity complexes and contribution of nonradiative processes in excitation energy deactivation. The absence of phosphorescence for halogenated BODIPY compounds may be connected with its efficient oxygen quenching, therefore, it is expected that further study of these complexes must be conducted in an oxygen-free environment. The results obtained in this work can be used as the basis for the design of optical devices.

The work was financially supported by RFBR (grants 14-03-90011-Bel_a).