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Nanostructured organosilicon luminophores as effective spectral shifters in a wide spectral region

Content

During the last years, the number of light-harvesting luminescent dendritic molecules has increased rapidly. One of the most interesting features of these molecules is a possibility of incorporation of different chromophores within one molecule that can lead to an intramolecular directional energy transfer from their peripheries to the center (a dendritic molecular antenna effect). It allows tuning the emission color of the core across the entire visible spectrum, which provides an efficient tool for controlling a wavelength of light emission in organic photonic and electronic devices. In this work we report investigation of the new nanostructured organosilicon luminophores (NOLs), where two different chromophores are connected to each other via silicon atoms, which brake the conjugation between them and fix them specifically in the space at the distance closer than 1-2 nm necessary for efficient Förster energy transfer [1,2,3]. NOLs possess several advantages: absorption in a wide optical spectral region; absorption cross-sections of the excitation light, which is 5–10 times higher as the cross-sections of the best low molar weight organic luminophores; very high photoluminescence quantum yield; luminescence spectra in the defined wavelength region; short luminescence lifetime as compared to the best inorganic luminophores. Photoluminescence study of the new molecules has shown an intramolecular energy transfer with the efficiency up to 99% and luminescence quantum yield up to 95% in different spectral regions. It should be noted that combination of different chromophores in NOLs allows tuning their emission wavelengths in a wide spectral region, which open possibilities for their wide application as spectral shifters – convertors of the emission with the energy of high frequency photons (140–400 nm) into emission in the visible spectral range (400–700 nm) [4,5].

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Author's Institution

Institute of Synthetic Polymer Materials RAS

Co-author's Institution

Primary author(s) : Dr. BORSHCHEV, Oleg (Enikolopov Institute of Synthetic Polymeric Materials of Russian Academy of Sciences)

Co-author(s) : Mr. SKOROTETCKY, Maxim (Institute of Synthetic Polymer Materials RAS); Dr. SURIN, Nikolay (Institute of Synthetic Polymer Materials RAS); Prof. PONOMARENKO, Sergey (Institute of Synthetic Polymer Materials RAS)

Presenter(s) : Dr. BORSHCHEV, Oleg (Enikolopov Institute of Synthetic Polymeric Materials of Russian Academy of Sciences)

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