Abstract

Synthesis and optical properties of amido-coumarins

The intense development of modern technologies initiated at the end of 20th century and continuing today has contributed to a significant increase of interest in new materials. Among them, amide oligomers consisting of many chromophore units attract the attention of many researchers. This is due to the possibility of forming a variety of structures characterized by high level of orderliness, which plays an important role in the construction of optoelectronic devices. It is also crucial to understand the relationship between the structure and properties of given compounds, taking into account interactions from the surrounding environment. Deeper understanding of relationship between the structure and properties of such systems will allow preparation of a new materials in a more conscious and precise manner. Given the above issues, the main goal of my PhD thesis was the synthesis of amido-coumarins and studying their optical properties. At the beginning I focused on the synthesis of bis-coumarin with steric hindrance around the amide bond, which was to secure a linear orientation of molecule. The spectroscopic measurements and theoretical calculations unambiguously showed, that the molecule adopts wedge shape with the angle value around 74 degrees. The X-ray analysis confirmed these results. Subsequently, I obtained bis-coumarins with intramolecular hydrogen bond as an additional rigidifying element. Further studies showed that hydrogen bond between amide hydrogen atom and oxygen atom provided a linear conformation. I obtained equally interesting results when I synthesized bis-coumarin with ester bond. It turned out, that molecule with ester linker possess more degrees of freedom. Using the previously developed methodology, I synthesized a tris-amido-coumarins. Both compound with steric hindrance and compound with intramolecular hydrogen bond adopted more conformations than previous examples, what is related to larger number of units. Nevertheless, these molecules exhibited similar photophysical properties like bis-coumarins. The last task was the synthesis of bis-coumarin based on benzo[*g*]coumarin core. This compound possessed π-expanded electrons system, which affected the optical properties. All synthesized compounds were the first examples, in which highly polarized coumarin units were connected in the head-to-tail orientation. The advanced spectroscopic measurements and theoretical calculations allowed to better understand the photophysical processes within these systems, which can be used for the design of new generation of electronic systems.

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