Synthesis and research of luminescent properties of resorcin[4]arenes

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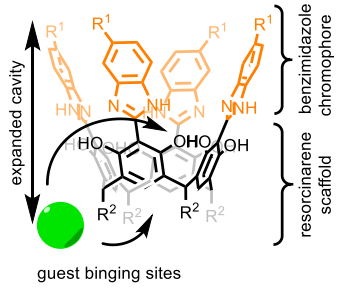

Supramolecular chemistry is an intensely developing area of chemistry. One of its key tasks is the construction of receptors and sensors. For this purpose, various types of macrocyclic compounds are used, which have binding sites that selectively interact with cations, anions or neutral molecules. Detection of the analyte binding process can be achieved in various ways, one of the most convenient of which is a luminescent (fluorescent) signal. The aim of the conducted research was to synthesize and study new macrocyclic luminescent compounds, in which the luminescent fragment is sensitive to changes in the chemical environment and integrated with the receptor fragment, which should ensure effective communication. The research hypothesis was that such a sensor design could provide large, selective and easily detectable changes in luminescence and in response to analyte recognition.

During the course of the research, I designed and obtained a number of macrocyclic compounds based on the resorcin[4]arene skeleton and containing benzimidazole groups (tetrabenzimidazolorezorcin[4]arenes) and analogous monomers, which were used in control experiments. For the obtained compounds, I determined the photophysical properties and binding properties towards a number of guests. With the help of control experiments and theoretical calculations, I suggested the plausible mechanisms of the observed processes. As expected, the obtained macrocyclic compounds - were characterized by an extended cavity, an extended chromophore system, luminescence, and some of them exhibited the excited state proton transfer (ESIPT) phenomenon, due to which they were characterized by large Stokes shifts (up to 170 nm in solution and up to 182 nm in the solid) and large values of dipole moments (up to 35 D). I found that they could be used (1) as „*turn-on*" receptors for organic cations (increase in luminescence intensity due to reduced intramolecular rotation, *RIR*), (2) as CH receptors for anion binding, and (3) as luminescent components of LSC materials (*Luminescent Solar Concentrators*). It was concluded that during the binding of guest molecules and during the closure of luminescent macrocyclic compounds in polymers, a number of phenomena, characteristic only of macrocyclic compounds, occurs, such as selective di-deprotonation and complexation or tautomerization between adjacent units with the formation of zwitterionic ion type structures. These changes were accompanied by unique changes in luminescence properties that did not occur for analogous monomers.