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Rozprawa doktorska pt.: *Charge transfer compounds as sources of laser light*

(Układy z przeniesieniem ładunku jako źródła światła laserowego)

Streszczenie w języku angielskim

This dissertation was carried out as part of the BioTechNan project - the program of interdisciplinary cross-institutional post-graduate studies KNOW in the field of Biotechnology and Nanotechnology, between:

1) Wroclaw University of Science and Technology - Faculty of Chemistry, Advanced Materials Engineering and Modeling Group;

2) French National Center for Scientific Research and University of Strasbourg, France - at The Institute of Chemistry and Processes for Energy, the Environment and Health (ICPEES).

The experimental studies presented in the dissertation are concerned with charge transfer compounds, i.e. commercially unavailable organic Excited-State Intramolecular Proton Transfer (ESIPT) chromophores that can be applied in the phenomena of light amplification. The work focuses on the characterization of these materials in the context of light-matter interactions. The vast majority of the investigated chromophores were based on a 2-(2'-hydroxyphenyl)benzazoles scaffold, which was appropriately modified by chemical synthesis in order to tune the emission properties of the tested derivative. This part of the research was carried out during internships at the ICPEES institute in France, under the supervision of Dr. Julien Massue. In addition to the synthesis, measurements of the spectroscopic properties of the tested derivatives were carried out in this laboratory, including measurements of the absolute quantum yield of potassium bromide pellets doped with the chromophore. All compounds, both the synthesized and those provided by Dr. Massue, were then analyzed in the laboratories of the Wroclaw University of Science and Technology, under the supervision of Prof. Jarosław Myśliwiec. The scope of the conducted experimental research included both the basic characterization of materials in terms of absorption and emission measurements in the form of dilute solutions and doped polymer films, as well as more complicated effects, such as random lasing action or amplified spontaneous emission. The basic parameters describing these phenomena, such as the lasing threshold values or the optical gain, were determined. Simultaneously, research was carried out on finding practical applications for the ESIPT dyes, e.g. the possibility of constructing real-time tunable DFB lasers, polychromatic lasers, or as photoinitiators in microfabrication.