STRESZCZENIE W JĘZYKU ANGIELSKIM

The doctoral dissertation was prepared as a result of participation in the BioTechNan project - Interdisciplinary Environmental Doctoral Studies KNOW in the field of Biotechnology and Nanotechnology, the work is a result of cooperation between:

1. Institute of Advanced Materials, Faculty of Chemistry, Wrocław University of Science and Technology

2. Department of Analytical Chemistry, Faculty of Chemistry,Wrocław University.

Additionally, as part of the project, measurements were carried out at the University of Angers in France in the MOLTECH Anjou Laboratory.

The doctoral thesis concerns the phenomenon of aggregation process of luminescent dyes in various matrices and solutions. Dye aggregates and their emission properties were characterized using a new method, with higher sensitivity compared to classical methods. The phenomenon of light amplification was used, with particular emphasis on amplified spontaneous emission and random lasering, as well as amplification in WGM spherical resonators. The synthesized compounds belonged to the cyanine group. Additionally, diketopyrrolopyrrole derivatives (DPP) and Rhodamine 6G (Rh6G) were tested. The materials mentioned above were selected for studies due to their widely known aggregation abilities. The research tested various methods of dye particle clusters production with a use of the influence of various factors of dye condensation. The compounds were characterized in terms of basic spectroscopic properties, such as absorption and emission in the form of thin films and solutions. Experiments of the light amplification for cyanine and diketopyrrolopyrrole derivatives were conducted in the form of thin films, along with the determination of characteristic parameters such as the location of the emission maximum and the laser thresholds. The ability of cyanines to amplify light in solvent solutions of different polarities was also checked. Aggregates of cyanine derivatives also showed optically nonlinear properties in the third harmonic of light generation experiment.