Streszczenie w języku angielskim Anna Popczyk „**D-π-A type of chromophores for light amplification and nonlinear optics applications*”***

The subject of the research are novel thiophene derivatives with the schematic structure of   
D-π-A, which due to their particularly designed structure, can be applied in the field of nonlinear optics and light amplification. The main aim was to create a group of thiophene-based compounds that exhibit multifunctionality, so the achieved properties can be tailored accordingly to specific practical applications. The research focuses on the investigation of how the structure of the electron-withdrawing moiety will affect the nature of the intramolecular charge transfer and to what extent it corresponds to the photophysical, nonlinear optical properties, as well as the ability to generate random laser action. First of all, 20 new thiophene derivatives were designed, synthesized and their photophysical properties were established. Furthermore, it was important to characterize the nonlinear optical properties by the means of the second and third harmonic generation, as well as the optical Kerr effect. Applied measurement techniques allowed the calculation of basic nonlinear parameters of each derivative. Moreover, the possibility of light amplification in the prepared systems was characterized, together with the determination of the basic parameters describing the phenomenon of random laser action. Finally, some practical applications of the investigated thiophene derivatives were proposed. Full investigation allows considering presented push-pull molecules as an interesting alternative for applications in modern photonics and optoelectronics.