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Synthesis and characterization of physicochemical properties of symmetric heterocyclic systems designed for applications in electronic devices.

The future of organic molecular materials technology is believed to be based on energy saving, flexible, light and non-expensive electronic devices. Thin semiconducting films made of heterocyclic compounds are interesting for these applications. They find a broad application in optoelectronic, spintronic, and electromechanical devices. Despite the fact that numerous organic semiconductors have been synthesized so far, the majority of them are far from economic requirements of present electronic technologies. Alongside benefits such as flexibility, possibility of fine tuning of their properties and lower cost of processing, development of new systems with greater carrier mobility, stability in air and solution processability is live issue.

Taking into consideration the interesting properties of tricyclic heteroaromatic systems I carried out an interdisciplinary research to obtain new, oxidatively stable, electrochromic, donor-acceptor polymers based on phenoxazine, phenothiazine, silylfluorene, xanthene and diphenylamine units. The selection of synthesized compounds was based on DFT calculations. The research included detailed spectroscopic and electrochemical characterization of sixteen new conducting oligomers. A comparison between theoretical study and measurement exhibits a good correlation between respective calculated and experimental values and demonstrates usability of conducted *ab initio* calculations in design of polymer semiconducting materials. Synthesized molecules display a diversity in terms of luminescence color in solution and/or in solid state and possess a broad application potential. Thin films of oligomers characterized by the most interesting optical and electrical properties were deposited on an electrode surface and used in a fabrication of prototype electronic devices especially in optical biosensor construction.