

Summary of doctoral thesis

Title "Addition, cycloaddition and coupling reactions for the synthesis of novel arene and heteroarene derivatives with bithienyl motifs"

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Dissertation is devoted to the synthesis of 1,2,3-triazoles, N-substituted pyrroles and various arenes (such as: anthracene, phenanthrene, pyrene) derivatives, all containing up to four 2,2'-bithiophen-5-yl groups.

The first group of compounds, ie. pyrrole derivatives were obtained by CuCl catalyzed addition reaction of commercially available primary amines (eg. aniline, methyl 4-aminobenzoate, N-ethyl-3-aminocarbazole) and 1,4-bis(2,2'-bithiophen-5-yl)-buta-1,3-diyne. Optimal conditions for developed synthesis and the isolation procedure for obtained products (ie. trisubstituted pyrroles) were determined. The impact of microwave radiation and catalyst fragmentation on the course and yield of the hydroamination reactions were examined too. Moreover, a developed methodology of synthesis and isolation (on a scale of few grams) of butadiyne derivative, became the subject of a patent for an invention titled "A process for preparing 1,4-bis(2,2'-bithiophen-5-yl)buta-1,3-diyne".

Derivatives of 1,2,3-triazole were obtained by the cycloaddition reaction of the organic azides (eg. decyl, 2,4-difluorbenzyle, 2,2'-bithienyl) and terminal (5-ethynyl-2,2'-bithiophene) or internal alkynes (1,2-bis(2,2'-bithiophen-5-yl)acetylene) catalyzed with copper and ruthenium compounds respectively.

The third group of compounds obtained under the doctoral dissertation were arenes (eg. benzene, fluorene, anthracene) and heteroarenes (eg. carbazole) derivatives containing up to four 2,2'-bithiophen-5-yl groups in the molecule, attached to the aromatic core by a triple bond. These derivatives were obtained by Sonogashira coupling reactions catalyzed with [Pd]/Cu in the presence of an amine.

Also primary electrochemical (redox potentials, stability of the obtained polymers under the oxidation-reduction conditions) and spectroscopic (absorption, emission, quantum yield, etc.) properties of the selected compounds were determined and the obtained results were compared with the values designated theoretically with methods of quantum mechanics.