

Abstract of the doctoral dissertation titled:

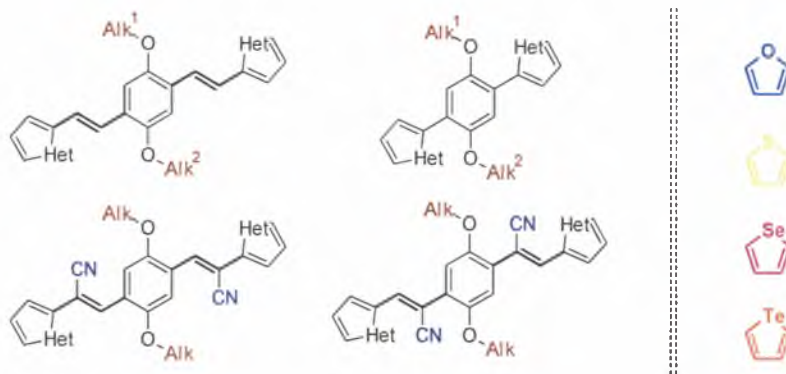
„Synthesis of selected π -conjugated dialkoxybenzene systems with terminal chalcogenophene units”

Author: Radosław Motyka, M.Sc. Eng.

Supervisor: Nikodem Kuźnik, Ph.D. Eng., D.Sc.

Numerous indications can be found in the literature that benzene ring systems conjugated with chalcogenophenes can be promising precursors of conductive polymers. The purpose of this work was to synthesize such model compounds incorporating different structural elements, including: alkoxy groups at the benzene ring, vinyl bonds of different stereo configuration between the aromatic units, or electron-withdrawing groups attached to the conjugated system.

The first part of the work includes a comprehensive literature survey to select structures with the most promising optoelectronic properties. Based on this analysis, four molecular models were designed, successively: 1,4-dialkoxy-2,5-bis[2-(chalcogenophen-2-yl)ethenyl]benzenes, 1,4-dialkoxy-2,5-bis[(*Z*)-1-cyano-2-(chalcogenophen-2-yl)ethenyl]benzenes, 1,4-dialkoxy-2,5-bis[(*E*)-2-cyano-2-(chalcogenophen-2-yl)ethenyl]benzenes and 1,4-dialkoxy-2,5-bis(chalcogenophen-2-yl)benzenes, for which efficient synthesis pathways were prospected and developed using the retrosynthetic approach.



The second part of the work describes the synthesis of above-mentioned systems and detailed spectroscopic characterization of the obtained compounds. 16 classes of compounds were obtained in total according to synthetic pathways as short as 3 stages, with the longest ones involving 6 steps. The starting materials for all targets were hydroquinone and 4-hydroxybenzaldehyde, which were converted into symmetric and asymmetric hydroquinone ethers. Those ethers were subsequently halogenated or halogenomethylated. The halogenomethyl derivatives were further transformed into cyanomethyl compounds, diethylphosphonates, phosphonium salts and terephthaldehydes. Final products with vinyl bonds in their structure were synthesized by the condensation reactions (Wittig, Horner-Wadsworth-Emmons or Knoevenagel), whereas for the synthesis of compounds without this bond, the coupling reactions (Suzuki-Miyaura and Stille) were used instead. Several products obtained as a mixture of isomers in the Wittig reaction were separated into individual components using high-performance liquid chromatography (HPLC).