SYNTHESIS OF CARBAZOLE-BASED MATERIAL WITH ACCEPTOR MOIETIES FOR PEROVSKITE SOLAR CELL TECHNOLOGY

Guostė Kaleininkaitė[1], Aida Drevilkauskaitė[1], Vytautas Getautis[1], Artiom Magomedov[1]

[1]Department of Organic Chemistry, Kaunas University of Technology, Lithuania
guoste.kaleininkaite@ktu.edu

Pollution free sources of renewable energy have become gradually more relevant in the last decade. Inexhaustible solar energy has been one of the prime areas of research and it has been established as a cost effective and reliable source of energy. In the last decade of research, significant progress has been made in the development of new materials for 3rd generation solar cell technology, specifically perovskite solar cells. One of the specific problems is related to the use of C_{60} as an electron transporting material [1]. However, the available electron-transporting chromophores have failed to substitute it, mostly due to the problems related with solubility. Therefore, it is important to find new structural concepts, that would avoid such limitations.

The aim of our work is to synthesize new electron transporting materials-candidates by introducing an indanedione acceptoring unit in the third and sixth position of 9-ethyl-9H-carbazole via two-step synthesis. First, by synthesizing 9-ethyl-9H-carbazole-3,6-dicarbaldehyde from N,N-dimethylformamide and 9-ethyl-9H-carbazole with the use of $POCl_3$ in 1,2-dichlorethane, and later substituting the two formyl groups with indanedione in ethanol.

The first round of synthesis resulted in a target compound, as was confirmed by the NMR spectroscopy method. However, high yields have not been achieved. The main reason lies in reduced reactivity of the monoaldehyde, and the complicated purification process of the intermediate compound. Further optimization of reaction conditions and ratio of reactants for the first step is required. After optimization, the photoelectrical properties of the materials will be evaluated.

[1] M. Stolterfoht et al., Visualization and suppression of interfacial recombination for high-efficiency large-area pin perovskite solar cells. Nat Energy, textbf3, 847–854 (2018).