Organic Dyes Based on [1,2,5] chalcogenadiazolo [3,4-c] pyridine: New Effective Materials for Solar Cells

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Owing to increasing demands for sustainable and renewable energy an exploration of lighttoenergy converters has become an area of great interest for many scientists and engineers. Having a relatively low cost and simplicity of maintenance and fabrication solar cells based on individual organic compounds represent one of the most promising photovoltaic technologies. The most perspective class of such technologies is the creation of dyesensitized solar cells (also known as DSSC's) based on molecules with DApA1 structure. Here D stands for a donor fragment of molecule, A for internal acceptor, p represents a p spacer and A1 acts not only as an external acceptor, but also as an 'anchor' which attaches organic molecule to the electroconductive layer in a solar cell. Importantly,photoelectric properties of the molecule can be considerably improved via variation of its' particular fragments.Therefore,our project is devoted to design of the dyes which correspond to the structure of DApA1, search of an optimal synthetic strategy of obtaining our target compounds and synthesis of the target compouds in gramscale amounts to create test solar cells on that basis whose photovoltaic properties will be verified in future. 1,2,5Chalcogenadiazolopyridines were used as principal acceptors due to their strong electronwithdrawing properties. Our synthetic strategy of obtaining target compounds is based on two successive reactions of Suzuki crosscoupling, followed by Knoevenagel condensation. As a result we haveobtained target compounds in gram-scale amounts. All the reactions were performed in optimal conditions. We have investigated optical and photovoltaic properties of all target compounds and confirmed that they can be used as highly effective components of DSSC's.

Awards Won:
American Chemical Society: Certificate of Honorable Mention