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作品編號 030037

參展科別 化學

作品名稱 **Light as energy source in chemical reaction.  
New synthesis of valuable  
dithienylacetylenes**

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## Abstract

Photochromism (from Greek φως photo “light” and χρωμα chroma “colour”) is determined as reversible transformation between two chemical species, induced by action of light [1]. Herewith, initial form and photoinduced isomer have different physical and chemical properties. The phenomenon is attractive for the design of hi-tech materials, including optical memory elements and molecular switches.

Diarylethenes is the most promising class of organic photochromic compounds due to outstanding thermal stability of both isomers and high photostability [2]. The size of so-called ethene bridge significantly affects the photochromic reaction. The photochromic diarylethenes with 4-, 5-, and 6-membered cyclic ethene bridge are known, but there is no example with 3-membered bridge.

In this study we report a new approach towards dithienylacetylenes 3 that include the synthesis of diarylcyclopropenones 2 via Friedel-Crafts alkylation of heterocyclic compounds 1 with tetrachlorocyclopropene and following UV-irradiation. It was found that the diarylethenes 2 do not display photochromic properties, but they undergo quantitative photoelimination of carbon monoxide upon UV-irradiation resulting in dithienylacetylene 3. Thus, we have proposed a new synthetic two-step approach to dithienylacetylenes 3 [3], which could be useful synthons in synthesis of photochromic diarylethenes with various ethene bridges.

The structures of the obtained compounds were proved by NMR and mass-spectroscopy. In the report, advantages of new synthetic approach for dithienylethenes over others will be discussed.

## References

1. R. Exelby and R. Grinter, *Chem. Rev.*, 1965, 65, 247-260.
2. M. Irie, T. Fukaminato, K. Matsuda, and S. Kobatake, *Chem. Rev.*, 2014, 114, 12174-12277.
3. A. G. Lvov, N. A. Milevsky, et al. *Chem. Heterocycl. Compd.* 2015, submitted

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The candidate presents a smart way of using photo-energy to promote decarbonylation of 2,3-dithienylcyclopropanone to give diphenylacetylene. In addition, the candidate has expanded the scope to a sequential photo-pericyclic elimination reaction to afford polynuclear-heterocyclic compounds. The quality of the research reaches graduate level. I have to express my congratulation to him for his success.