

2014 年臺灣國際科學展覽會 優勝作品專輯

作品編號 030032

參展科別 化學

作品名稱 First photochromic diarylethenes with
cyclohexenone ethene "bridge"

得獎獎項 一等獎

國 家 Russian Federation

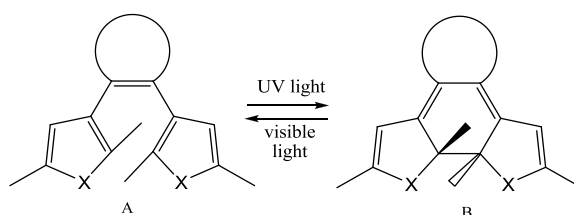
就讀學校 Moscow Chemical Lyceum

作者姓名 Alexey Kavun

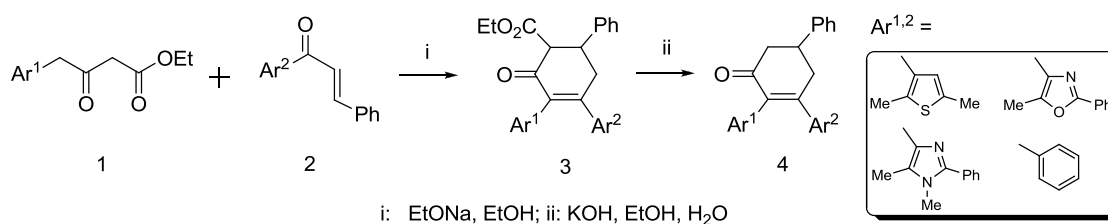
Abstract

Photochromism is determined as reversible transformation between two chemical species, induced by action of light [1]. Herewith, initial form and photoinduced isomer have different properties, first of all, spectral. The phenomenon is attractive for the design of hi-tech materials for different applications, including optical memory elements and molecular switches.

Diarylethenes are the most promising class of organic photochromic compounds due to outstanding thermal stability of both isomers and high photostability [2, 3]. Photochromism of diarylethenes explained by reversible electrocyclic reaction of hexatriene system, provoked by UV light, back reaction is induced by visible light.



In this work we have proposed a new class of photochromic diarylethenes with cyclohexenone ethene “bridge” **4**. The key stage of the synthesis is “one-pot” reaction of ketoesters **1** and chalcones **2** in ethanol in the presence of sodium ethoxide that includes Michael reaction and subsequent intramolecular condensation of the resulting product. The final decarboxylation of semi-product **3** results in target diarylethenes **4**.



We have prepared a wide range of photochromic diarylethenes with thiophene, oxazole, imidazole and benzene derivatives as aryl moieties. The spectral characteristics of compounds obtained have also been discussed.

References

1. H. Bouas-Laurent, H. Durr, *Pure Appl. Chem.*, **2001**, 73, 639.
2. M. Irie, *Chem. Rev.* **2000**, 100, 1685.
3. V.Z. Shirinian, A.A. Shimkin, D.V. Lonshakov, A.G. Lvov, M.M. Krayushkin. *J. Photochem. Photobiol. A: Chemistry*, **2012**, 233, 1.

評語

Cyclohexnone bearing two heterocycli five-membered aromatics attached on the “ethane” moiety of the chn are synthesized. Such a molecular system is designed to stun photochromism via UV-irradiation. The researcher exhibits very solid knowledge in organic synthesis, characterization, as well as physical organic chemistry.