[2+2+2] Cyclotrimerization of Alkynes and Nitriles

Biography

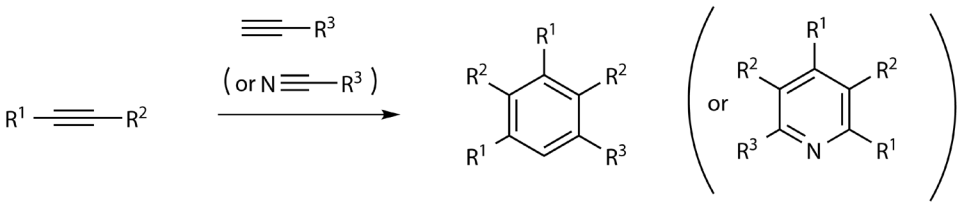
Gabriela Siemiaszko studied at the University of Białystok and Nicolaus Copernicus University in Toruń, both in Poland, obtaining her M.Sc. degree in 2014. After an internship at the Universidade Nova de Lisboa, Portugal, she joined the group of Dr. Yvan Six at the Ecole Polytechnique, France, where she completed a further internship, and then subsequently began her Ph.D. studies.

Institution

Ecole Polytechnique, Palaiseau, France

Abstract

We are interested in [2 + 2 + 2] cyclotrimerizations of alkynes for the preparation of variously substituted benzene rings. *Science of Synthesis* Online was used to undertake a comprehensive review of this topic.



Scheme 1 [2 + 2 + 2] Cyclotrimerization of Alkynes and Nitriles

Discussion

The object of our research is to perform [2 + 2 + 2] cyclotrimerizations utilizing a reagent system based on titanium(IV) isopropoxide. In order to conduct further investigations into this process, it was necessary to familiarize ourselves with the previous and current advances in this area of research. For this purpose, a full-text search of *Science of Synthesis* using keywords was performed; although possible, it was decided not to conduct structure searches using the drawing tool because of the very wide range of structures that were the subject of interest.

The query “cyclotrimerization of alkynes” resulted in 59 hits. By analyzing the position of the query term as being either in the title or in the text of the entries in the resulting hitlist, and the position of the selected document in the table of contents, we found it easy to assess the usefulness of the hits. A selection of the generated hits contained a comprehensive (but not overlength) overview of the subject matter, supported by examples from the literature. Furthermore, experimental procedures were also provided directly, a feature that is of particular value for a busy student. Hyperlinks lead directly to the cited references. Clear tabulated information allows for the very quick evaluation of the methods (Scheme 2), and facilitates a comparison of the range of yields obtained in the synthesis of different compounds.

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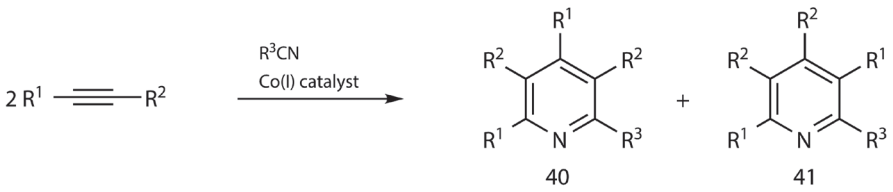

R^1	R^2	R^3	Ratio (**40**/**41**)	Yield (%)	Ref
Me	Me	Et	--	77	[44]
H	H	$(CH_2)_{10}Me$	--	96	[44]
H	H	$CH=CH_2$	--	78	[44]
H	H	Ph	--	89	[44]
Ph	H	Ph	77:23	51	[44]
Me	H	$CH=CH_2$	71:29	85	[44,45]
$(CH_2)_4Me$	H	Me	69:31	58	[44,45]
Me	H	3-pyridyl	62:38	94	[44]

Scheme 2 Table Showing Results of Cobalt-Catalyzed Cyclotrimerization (taken from Section 19.5.15.3.2)

By using the REFINE options on the results page, the hitlist could be shortened to 11 hits when filtered to include only those hits where the search term occurred in the title of a section, and the hitlist could also be helpfully sorted by the date of publication. The refine options are very useful, particularly as information about [2 + 2 + 2] cyclotrimerizations can also be found spread throughout *Science of Synthesis*, sometimes in chapters where it is not the main focus of the content. The effective searching tools in *Science of Synthesis* that allow the user to access the key sections on the topic in question are therefore very important.

Conclusion

A text search of the content was very useful in preparing an overview on [2 + 2 + 2]-cyclotrimerization reactions of nitriles and alkynes. The information is easily available, comprehensive, and contains recent advances in the area. *Science of Synthesis* Online is easy to use, and the filtering tools allow the user to obtain the most relevant hits.