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Anthracene-based molecular glasses: Design, synthesis and applications in nanolithography and organic electronics overview and perspectives

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Anthracene derivatives constitute a promising class of small molecules with many potential applications, in the areas of organic electronics and nanolithography. Indeed, anthracene exhibits attractive properties for incorporation in films used in electronic devices (electronic conductivity, high charge mobility, appropriate ionization potential) and nanolithography applications (high etch resistance). Nevertheless, its high crystallization and sublimation tendencies pose severe challenges in the use of robust solution processes and in the formation of high quality films. Thus, the development of optimized anthracene-based compounds with tunable properties depending on the application is necessary. Towards this direction, developed synthetic routes lead, mainly, to symmetric structures using expensive organometallic reactions. Herein, a design strategy for the synthesis of anthracene-based molecular glasses (MGs), suitable for applications in nanolithography and with perspectives for application in organic photonic devices is presented. Film-forming properties were tuned, by controlling molecular architecture, structure flexibility and incorporation of tetrahedral and planar cores. Cheap, efficient and scalable methods, based mainly on esterification reactions, were applied, leading to the synthesis of a "library" of diverse anthracene-based structures from common intermediates. Many of these molecules were highly soluble, thermally stable and formed amorphous and stable films, introducing a new class of solution-processable anthracene-based MGs with high etch resistance and suitable for positive-tone chemically amplified systems. Moreover, in certain cases, film patterning in EUV, reached dimensions below 30 nm. Recently, selected compounds have been tested as active layers in OLED structures affording very promising results. Additional perspectives of this research will be discussed.

Biography

Veroniki P Vidali is an Organic Chemist. She has completed her PhD at Agricultural University of Athens in 2004. She worked as a Post-Doctoral Fellow at Natural Products and Bioorganic Chemistry Laboratory, Institute of Nanoscience and Nanotechnology at NCSR "Demokritos" from 2004 to 2007 and as Scientific Staff from 2007 to 2017, while since 2017 she has been working as a Research Assistant at NCSR "Demokritos". Her main research interests include "Organic synthesis of bioactive natural products and polyaromatic compounds applied in nanotechnology". She has co-authored 18 peer-reviewed research articles in international journals and one book-chapter.

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