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The data in the field of spiro[2.4]hepta-4,6-dienes published during the last 15 years are integrated and described systematically. The changes in the development of studies that took place during this period are noted. The methods for the synthesis, reactivity details and key chemical transformations of spiro[2.4]hepta-4,6-dienes are considered. Primary attention is paid to the application of these compounds in organic synthesis.

Bibliography — 207 references.

**Alkynes as a versatile platform for construction of chemical molecular complexity and molecular 3D-printing** 226

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The current level of scientific and technological development requires the design of general tools and techniques. A highly versatile technology is 3D-printing, which allows quick and efficient creation of materials and biological objects with desired shape and composition. To date, methods have been developed for 3D-printing of macro- and nano-sized objects and for production of films and deposited materials with molecular precision, but the most promising technology is printing at the molecular level (molecular 3D-printing) for the purpose of direct construction of molecular complexity. This process is currently at the initial stage of selection of simple molecules — building blocks characterized by flexibility, availability and ease of modification. In this review, we examined the possible versatile synthons suitable for the preparation of the main types of organic compounds by implementation of molecular 3D-printing. The presented data indicate that alkyne molecules will be recruited as a building material in a molecular 3D-printer working on hydrocarbons.

Bibliography — 428 references.

**Photocatalytic activity of layered perovskite-like oxides in practically valuable chemical reactions** 248

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The photocatalytic properties of layered perovskite-like oxides corresponding to the Ruddlesden–Popper, Dion–Jacobson, and Aurivillius phases are considered. In the series of photocatalytic processes under discussion, principal positions are occupied by water decomposition, hydrogen evolution from aqueous solutions of some organic compounds, and decomposition of model organic contaminants. It is demonstrated that these reactions can be performed in the presence of layered perovskite-like oxides and composite photocatalysts based on them on exposure to ultraviolet or visible light. Among the factors influencing the photocatalytic activity, the specific surface area, the band gap, the particle morphology, the cationic and anionic doping, and surface modification are considered. Particular attention is paid to the increase in the photocatalytic activity of layered oxides by means of intercalation, ion exchange and exfoliation inherent in this class of compounds. The prospects of using layered perovskite-like oxides in photocatalysis are discussed.

Bibliography — 253 references.

V.V.Butova,<sup>a</sup> M.A.Soldatov,<sup>a</sup> A.A.Guda,<sup>a</sup> K.A.Lomachenko,<sup>a,b</sup> C.Lamberti<sup>a,b</sup><sup>a</sup> *International Research Center 'Smart Materials', Southern Federal University, Rostov-on-Don, Russia*<sup>b</sup> *Department of Chemistry, NIS and CrisDi Interdepartmental Centers, INSTM Reference Center, University of Turin, Italy*

The key methods for the synthesis and characterization of metal-organic frameworks (MOFs) are considered. Owing to the modular structure, there is a wide variety of types of MOFs with various metal active sites and binding organic ligands (linkers). These compounds represent a new stage of development of porous materials in which it is possible to vary the pore size and structure of the active sites within wide limits. The set of experimental methods considered in this review is sufficient for the study of long-range and short-range order of the MOF crystal structure, determining the morphology of the samples and diagnostic processes in the metal active site in the course of chemical reactions. The interest in metal-organic framework structures is primarily associated with wide scope of their practical application ranging from the separation and storage of gases to chemical reactions within the pores.

Bibliography — 362 references.

**Methods for the synthesis of aza(deaza)xanthines as a basis of biologically active compounds**

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The review integrates methods for the synthesis of aza(deaza)xanthines including pyrrolo-, pyrazolo- and triazolopyrimidines which form the basis for many biologically active compounds. A broad spectrum of synthetic approaches to the formation of target heterocycles is presented, differing in the methods of construction of six- and five-membered rings and the reagents used. The data are arranged according to types of heterocyclic systems and would be useful for professionals in organic, medicinal and pharmaceutical chemistry.

Bibliography — 195 references.