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# Успехи химии

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# Russian Chemical Reviews

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**Catalytic conversion of isoelectronic CO and N<sub>2</sub> molecules in the presence of hydrogen** RCR5094

E.A.Permakov, V.M.Kogan

*N.D.Zelinsky Institute of Organic Chemistry of the Russian Academy of Sciences, Russia*

The review is devoted to the comparative consideration of the mechanisms of transformations of isoelectronic molecules of carbon(II) oxide and molecular nitrogen in reductive conversion processes. The similarities and differences in the activation of these molecules are demonstrated. Fundamentally and commercially relevant catalytic systems are described and parallels in their operation are also shown. Promising trends in the search for new catalytic systems and processes are noted. Related molecules with similar reductive conversion processes are indicated.

Bibliography — 337 references.

**Triarylphosphonium compounds as effective vectors for mitochondria-targeted delivery systems: decoration strategies and prospects for clinical application** RCR5095

T.N.Pashirova,<sup>a</sup> A.V.Nemtarev,<sup>a</sup> E.B.Souto,<sup>b,c</sup> V.F.Mironov<sup>a</sup>

<sup>a</sup> *Arbuzov Institute of Organic and Physical Chemistry, FRC Kazan Scientific Center of the Russian Academy of Sciences, Kazan, Russia*

<sup>b</sup> *UCIBIO – Applied Molecular Biosciences Unit, MEDTECH, Laboratory of Pharmaceutical Technology, Department of Drug Sciences, Faculty of Pharmacy, University of Porto, Portugal*

<sup>c</sup> *Associate Laboratory i4HB - Institute for Health and Bioeconomy, Faculty of Pharmacy, University of Porto, Portugal*

Mitochondrial dysfunctions lead to the emergence and development of a large number of diseases. The present review gives the first systematic survey of various aspects of studies of mitochondria-targeted nanosystems containing triphenylphosphonium vector groups providing targeted delivery of drug substances to these organelles. Approaches to the design of both the initial triphenylphosphonium components and various nanoparticles bearing these groups are summarized and analyzed. The relationship between the key parameters of triphenylphosphonium nanoparticles (chemical composition, size, shape,  $\zeta$ -potential, drug loading, drug encapsulation efficiency, *etc.*) and the biological action is discussed; in some cases, the mechanism of mitochondria targeting is presented. The design principles and preparation methods for mitochondria-targeted triphenylphosphonium delivery nanosystems are of interest to researchers specializing in the field of nanomaterials, nanotechnology, molecular biology, biotechnology and pharmaceutical chemistry.

Bibliography — 243 references.

**Platinum(IV)-based prodrugs as an alternative to Pt(II)-based drugs: synthesis and biological action** RCR5096

D.V.Spector, A.A.Bublely, E.K.Beloglazkina, O.O.Krasnovskaya

*Faculty of Chemistry, Lomonosov Moscow State University, Russia*

The chemotherapy with cisplatin and its analogues, widely used in medical practice, is associated with undesirable side effects caused by non-selective ligand exchange and binding of the complexes to various biomolecules in the body. An alternative to classical platinum(II)-based drugs are platinum(IV) prodrugs, that is, platinum(II) complexes additionally modified with diverse biologically active axial ligands, including known pharmaceutical products. In recent years, quite a few studies devoted to the design of effective Pt(IV) prodrugs have been published, with some

of the developed agents being markedly superior to clinically used cisplatin and carboplatin in therapeutic efficacy. This review summarizes the synthetic approaches to the design of Pt(IV) prodrugs and modification of the axial ligands. The second part of the review is devoted to the biological activity of Pt(IV) prodrugs reported in the period from 2018 to 2023 and comparison of various approaches to the design of effective anticancer agents based on these compounds.

Bibliography — 239 references.

## **Chemistry and electrochemistry of CeO<sub>2</sub>-based interlayers: prolonging the lifetime of solid oxide fuel and electrolysis cells**

RCR5097

M.V.Erpalov,<sup>a,b</sup> A.P.Tarutin,<sup>a,b</sup> N.A.Danilov,<sup>a,b</sup> D.A.Osinkin,<sup>a,b</sup> D.A.Medvedev<sup>a,b</sup>

<sup>a</sup> *Institute of High Temperature Electrochemistry, Ural Branch of the Russian Academy of Sciences, Ekaterinburg, Russia*

<sup>b</sup> *Hydrogen Energy Institute, Ural Federal University, Ekaterinburg, Russia*

Research and development of solid oxide fuel cells (SOFCs) and solid oxide electrolysis cells (SOECs) are currently of paramount importance in terms of realizing hydrogen energy and carbon emission reduction programs, which many countries have committed to. Although, there are many outstanding results in the fabrication and characterization of SOFCs and SOECs with promising oxygen-ionic and proton-conducting electrolytes, conventional zirconia electrolytes are still widely used not only in a lab-scale setup, but also in the form of enlarged cells and stacks, with the experimental operation of the latter during 10000–100000 h. To ensure good performance stability and microstructural integrity of such multilayer cells, a special attention should be paid to the chemical activity of functional materials toward their interaction with each other, especially in long-term focus. The literature analysis has shown that many undesirable processes occur in SOFCs and SOECs with the classical pairs of zirconia electrolytes and strontium-containing electrodes, including element segregation and interdiffusion, insulating phase formation, microscopic defect appearance, and delamination. Some of these processes can be efficiently eliminated by using so-called interlayers designed from doped ceria materials. Due to their numerous beneficial functions, such interlayers have several synonymous names: blocking, barrier, buffer, or protecting layers. Herein, we review the recent progress and achievements in the fundamental and applied research on ceria interlayers and their impact on chemistry and electrochemistry of solid oxide cells based on classical zirconia electrolytes as well as promising oxygen-ionic and proton-conducting analogs.

Bibliography — 405 references.