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Innovative nanomaterials revolutionizing clinical biosensor development: a review **RCR5168**

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Nanomaterial-based biosensors have advanced rapidly as transformative technology in clinical diagnostics, offering unparalleled sensitivity, selectivity and versatility. This review provides a comprehensive analysis of the latest developments in biosensors incorporating nanostructured materials, with a focus on their clinical applications. We discuss the wide variety of nanomaterials used in biosensor production, such as carbon-based nanomaterials, metal nanoparticles, quantum dots and two-dimensional materials like graphene and transition metal dichalcogenides. Furthermore, we examine how these nanomaterials are integrated into different biosensing platforms, including electrochemical, optical, and surface plasmon resonance sensors. We emphasize their ability to rapidly and accurately detect clinically relevant biomarkers and analytes. The review offers an in-depth evaluation of the current state of nanostructured biosensor technology and pinpoints critical areas for future research and innovation in this rapidly evolving field.

Bibliography — 275 references.

Hybrid structures based on gold nanoparticles and organic fluorophores: synthesis, properties, and applications in theranostics **RCR5169**

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Combination of the beneficial properties of gold nanoparticles and organic fluorophores forms the basis for the development of many advanced agents for bioimaging and laser medicine. The localized surface plasmon resonance of gold nanoparticles enables the control of the optical response and photodynamic activity of neighbouring molecules, being a powerful tool for fine tuning of their target physicochemical properties. Among numerous reviews devoted to the synthesis and optical properties of gold nanoparticles and their applications in particular areas of medicine and bioanalysis, there are no recent studies focusing on specific features inherent in hybrid structures of gold nanoparticles with fluorophores. Therefore, the goal of the present review is to consider the features of such plasmonic structures, the basic principles responsible for their optical properties, and modern approaches to attain multiplexed and multimodal response. The review also describes the existing combinations of gold nanoparticles and organic fluorophores and hybrid structures based on these components and presents their role for solving relevant tasks of biomedicine.

Bibliography — 240 references.

The halogen effect in ruthenium catalysis

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The development of new catalysts is evolving in few ways. One is to design complexes with increasingly complicated ligands. Although effective in terms of the selectivity achieved, this approach has the disadvantage of making catalytic systems progressively more expensive. Another path is to boost catalytic activity by modifying the common elements of the ligand environment. In particular, to date, there have been excellent reviews of the physical and chemical properties of various halogen-containing complexes but a systematic comparison of their catalytic performancy is lacking. The present review partially fills this gap by comparing the activity and selectivity of catalysts containing Ru–I and Ru–Cl bonds. Though the influence of numerous parameters, *viz.*, the leaving ability of a halogen, the stability of the complex, its redox potential, *etc.*, does not allow for a reliable prognosis of their outcome for the catalyst efficiency in the general case, certain predictions and explanations can be made within some classes of reactions. Some of them are given in this review.

Bibliography — 131 references.

New catalytic organometallic reactions that changed the strategy of organic synthesis RCR5172

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The review integrates, for the first time, the results of studies carried out in the world over the last 15–20 years on the development and application of fundamental organometallic reactions catalyzed by transition metal complexes that give new carbon–carbon, metal–carbon, and heteroatom–carbon bonds and on the synthesis of small, medium, and large metallacarbycles containing main group metals (Mg, Al, B). The review addresses data on the use of new organometallic reactions and metallacarbycles for the preparation of practically important synthetic analogues of natural compounds, *Z,Z*-diene and *Z,Z,Z*-triene unsaturated carboxylic acids, acetogenins, leimbehynes, regular isoprenoids, insect pheromones with a record high stereochemical purity, as well as toxins, heterocycles, and biaryls, the synthesis of which by other methods requires the use of expensive reagents or multistep procedures.

Bibliography — 217 references.