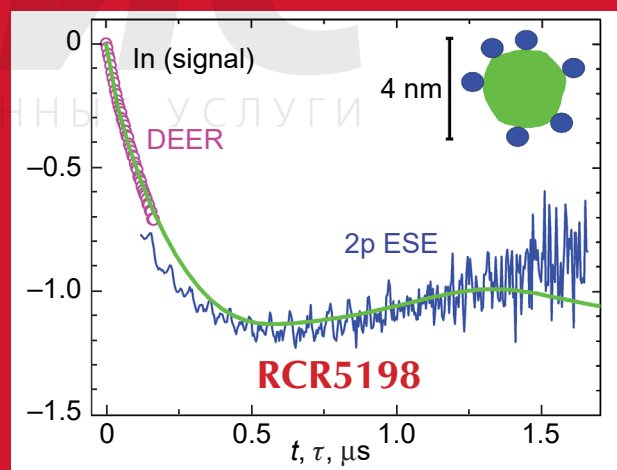
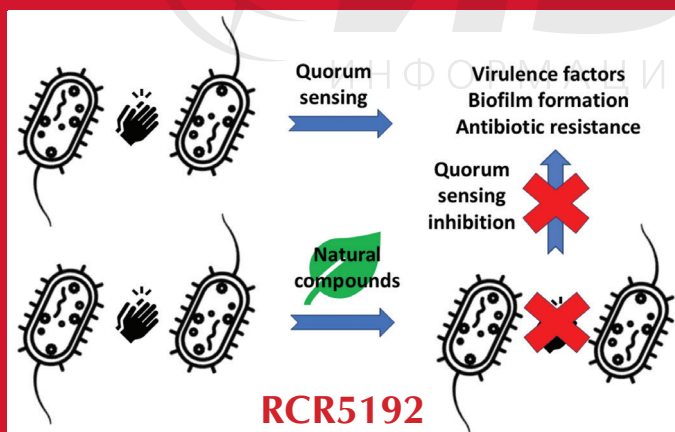
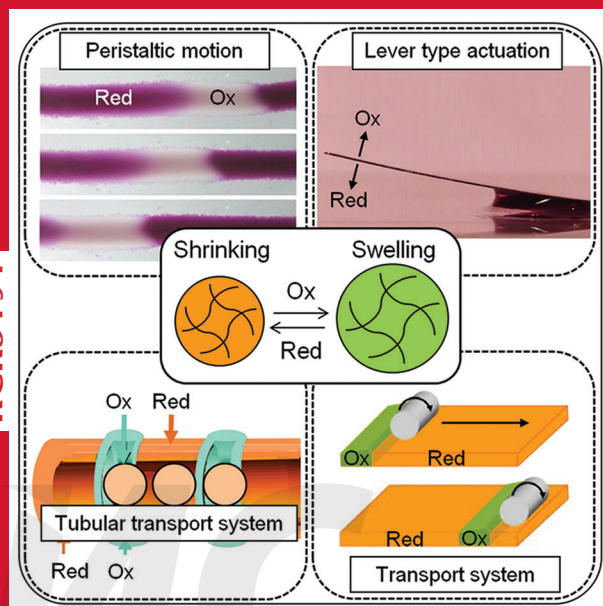


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## Содержание

N статьи

Е.Ю.Пикалова,  
Н.С.Пикалова,  
Е.А.Филонова

**RCR5186**

Технология инфильтрации воздушных электродов ТОТЭ — электролит-ориентированный подход

И.Л.Мальфанов,  
Е.Г.Чупахин,  
О.В.Лагунова,  
А.И.Лаврова

**RCR5191**

Автономные автоколебательные хемомеханические гели: последние достижения и перспективы развития

Л.К.Садиева,  
К.В.Гржегоржевский,  
В.А.Платонов,  
С.Сантра,  
Г.В.Зырянов,  
В.Л.Русинов

**RCR5192**

Ингибиторы «чувства кворума» растительного происхождения: взаимосвязь структура–активность

С.А.Дзюба

**RCR5198**

Импульсная дипольная спектроскопия ЭПР наноразмерных олигомеров и кластеров молекул

## Contents

### **Electrolyte-centered approach to infiltration technology: surway of enhanced air electrodes for ZrO<sub>2</sub>-based solid oxide cells**

**RCR5186**

E.Yu.Pikalova,<sup>a,b</sup> N.S.Pikalova,<sup>c</sup> E.A.Filonova<sup>b</sup>

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Due to significant progress in the development of thin-film deposition technology, the operating temperatures of electrochemical cells with conventional Y<sub>2</sub>O<sub>3</sub>-stabilized ZrO<sub>2</sub> electrolytes has been substantially reduced. However, the selection of suitable air electrodes for ZrO<sub>2</sub>-based solid oxide fuel, electrolysis and reversible cells operating at intermediate temperatures (IT, 600–750°C) is still problematic. This issue is related to both insufficient oxygen reduction reaction activity at reduced temperatures characteristic to air electrode materials traditionally used in combination with Y-stabilized ZrO<sub>2</sub> in high-temperature devices, as well as the thermomechanical/chemical incompatibility of most state-of-the-art electrode materials with Zr-containing electrolytes. Infiltration is a viable method for fabricating nanocomposite electrodes under mild sintering conditions to avoid mismatch issues. This review adopts an electrolyte-centered approach, offering a comprehensive summary of the progress made in applying the infiltration technique to the development of air electrodes for electrochemical cells with ZrO<sub>2</sub>-based electrolytes. A review of the performance enhancement of air electrodes with the electrolyte and porous backbones, obtained by infiltrating electron-conducting and mixed ionic-electronic conducting materials, catalytically active oxides and noble metals. The use of infiltration to improve the performance of air electrodes in commercial cells is being explored. The review reveals the excellent benefits of the infiltration technology in designing solid oxide cells that satisfy intermediate temperature criteria, as well as large-scale manufacturing.

Bibliography — 397 references.

### **Autonomous self-oscillating chemomechanical gels: recent achievements and development prospects**

**RCR5191**

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The relevance of the subject of the review is due to increasing interest of scientists and engineers in the search for and study of autonomously functioning chemomechanical materials and the application of these materials for the development of biomimetic devices. This research area lacks full-scale reviews analyzing all currently available types of autonomous self-oscillating chemomechanical gels, promising materials for the design of artificial muscles for soft robots and chemomechanical devices. This review fills this gap by extensively covering the relevant information on this subject matter and giving comparative analysis of the objects, including the drawbacks of the existing gels driven by the Belousov–Zhabotinsky reaction (BZ gels) and prospects for the development of new gels with specified properties. A more comprehensive classification of the most promising BZ gels developed to date is given.

Bibliography — 123 references.

## Quorum sensing inhibitors of plant origin: structure–activity relationships

RCR5192

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The research into quorum sensing inhibitors is mainly directed towards fighting pathogenic bacteria resistant to therapy with antimicrobial drugs. Natural quorum sensing inhibitors may serve as an effective alternative to antibiotics, since they are less likely to cause the development of drug resistance of pathogenic microbiota. Currently, the search for effective inhibitor molecules and analysis of structure–activity relationships among natural compounds is considered to be the most obvious strategy towards solution of the antibiotic resistance problem. Since plants have co-evolved with the microbial environment and have been constantly exposed to bacterial infections, they successfully developed chemical mechanisms to fight external pathogens, in particular the quorum sensing inhibition. The review considers the secondary metabolites of various classes of plants such as terpenes, quinones, coumarins, stilbenes, alkaloids, curcuminoids, flavonoids, phenolic compounds, and their derivatives and analogues that possess quorum quenching activity. Some aspects of the structure–activity relationships for the described compounds are highlighted for the first time.

Bibliography — 139 references.

## Pulsed dipolar EPR spectroscopy of nanometer-sized oligomers and clusters of molecules

RCR5198

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Pulsed dipolar spectroscopy (PDS) in electron paramagnetic resonance (EPR) allows studying magnetic dipole-dipole interactions between the spins of unpaired electrons located in the nanometer range of distances from each other. The methods of PDS include double electron-electron resonance (DEER), double quantum coherence (DQC), single frequency technique for refocusing dipolar couplings (SIFTER), relaxation-induced dipolar modulation enhancement (RIDME), and the simple twopulse electron spin echo method (2p ESE). Previously published reviews on the application of PDS methods have focused primarily on the study of doubly spin-labeled nanoscale molecules; the aim of this review is to discuss the potential of PDS for nanoscale oligomers and clusters of molecules containing more than two spin labels. The review attempts to comprehensively analyze the limitations of PDS methods that arise for these systems and possible ways to overcome them, and analyzes the experimental data already obtained.

Bibliography — 136 references.