

# Успехи химии

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## Содержание

№ статьи

**Ю.В.Иони,  
M.Farooq,  
D.Roshka,  
A.K.Pal,  
Д.В.Красников,  
А.Г.Насибулин**

**RCR5155**

Производство, распространение и удаление микропластика из окружающей среды: обзор

**И.Р.Рамазанов,  
Р.Н.Кадикова,  
А.М.Габдуллин,  
У.М.Джемилев**

**RCR5158**

Каталитическое карбоцинирование ацетиленовых соединений под действием комплексов переходных металлов

**Л.Б.Кривдин**

**RCR5159**

Исследование лигнина и продуктов его переработки методом ЯМР: последние достижения и перспективы

# Russian Chemical Reviews

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Volume 94 Number 3 2025

## Contents

### **Microplastic production, distribution, and removal from the environment: a review** RCR5155

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The presence of microplastics (MPs) in the environment is a highly relevant and aggravating environmental problem, which is a concern not only for specialists in various fields but also for everyone who cares about the future of the Earth. The ever-increasing production of polymers and the expanding use of plastic products enlarged MP concentrations in the Earth's ecosystem. The need to control the accumulation and spread of MPs is caused by the current crisis where no microplastic-free areas have remained on Earth. The number of studies dealing with the existing and potential threat to living organisms from the accumulation and consumption of MPs is increasing every year. The aim of this review is to systematize the available information on the occurrence of MPs in the environment and briefly describe the main types of polymer materials acting as MP sources and mechanisms of MP formation and transport in the environment. The hazardous behaviour of MPs is analyzed by considering their impact on the physiology of aquatic and soil organisms. Special emphasis is on demonstrating the adverse environmental effect of the emissions from 3D printing with polymer materials. An overview of various methods for MP capture is given to facilitate the analysis and development of more reliable methods for MP removal and disposal. As a result of the review, we assess the long-term environmental and human health consequences of MP exposure. Understanding the mechanisms of MP formation, lifecycle in the environment, and ways of interaction with living organisms will facilitate the development of methods for controlling the spread of MPs and the design and implementation of effective techniques for environmental remediation to prevent the adverse ecological consequences.

Bibliography — 244 references.

### **Catalytic carbozincation of acetylenic compounds catalyzed by transition metal complexes** RCR5158

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Over the last 10 years, conceptually new results have been obtained in the field of unsaturated organozinc reagents; these results need to be analyzed and integrated. This review systematically considers data on the catalytic carbozincation reactions of alkynes, which give alkenyl organozinc compounds, highly reactive intermediates for the synthesis of functionally substituted olefins. The reactions catalyzed by copper, iron, cobalt, nickel, and rhodium complexes are described. A separate part of the review addresses the catalytic reactions initiated by zirconium and titanium compounds. The reaction conditions are indicated; in some cases, putative reaction mechanisms are discussed.

Bibliography — 135 references.

## **NMR studies of lignin and lignin-derived products: recent advances and perspectives RCR5159**

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The present review focuses on the most recent results of a liquid-phase nuclear magnetic resonance (NMR) study of lignin together with the lignin-derived products and related chemicals. Collected and discussed are the recent applications of  $^1\text{H}$ ,  $^{13}\text{C}$ , and  $^{31}\text{P}$  NMR spectroscopy as well as the NMR of less popular nuclei to the structural studies and practical recommendations in this field. Due to the complexity of lignin and the products of its transformation, their NMR spectra consist of a number of overlapping signals belonging to different structural types. In this regard, comprehensive studies of lignin by NMR over the past few decades have revealed characteristic functional groups of lignin and lignin-related products together with the spectral regions in which they resonate. Quantitative NMR spectra of  $^1\text{H}$ ,  $^{13}\text{C}$  together and less popular nuclei such as  $^{31}\text{P}$  are used to characterize different structural units of lignin (such as guacil, syringil and *p*-hydroxyphenyl), which provide aromatic and saturated carbons spread over many structural moieties.

Bibliography — 54 references.

