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TOPIC: SEMICONDUCTING POLYMERS AND THEIR PRODUCTION TECHNOLOGY

Djuraeva U. G.
Nomozov A. K.
Senior Lecturer, Department of Chemical Engineering, Termez State University of Engineering and Agrotechnologies, PhD.Assoc. Prof., Assistant, Department of Chemical Engineering, Termez State University of Engineering and Agrotechnologies

Annotation

This thesis explores the physical and chemical properties of semiconducting polymers, their structural features, operational principles, and production technologies. The significance of organic semiconducting polymers—such as polyaniline, polypyrrole, and polythiophene—in modern nanoelectronics, optoelectronics, and energy devices is analyzed. The synthesis processes, doping techniques, and application methods (such as spin-coating and inkjet printing) are discussed in detail. Practical applications in devices like organic light-emitting diodes (OLEDs), organic photovoltaics (OPVs), and biosensors are also presented. As a result, the technological potential and future prospects of semiconducting polymers are summarized and evaluated.

Keyword: Polymers, semiconducting polymers, technologi.

Introduction

In recent years, the rapid development of modern electronics and nanoelectronics has significantly increased the demand for new materials, particularly **semiconducting polymers**. These polymers are distinguished by their lightweight nature, flexibility, and low cost. They are considered promising alternatives to traditional silicon-based materials.

1. General Concept of Semiconducting Polymers

Semiconducting polymers are **organic compounds** capable of conducting electric current, although their conductivity is lower than that of metals. They contain **conjugated systems** (i.e., structures with alternating single and double bonds), which allow electrons to move freely through the polymer chain.

2. Types of Semiconducting Polymers

The most widely studied semiconducting polymers include:

- Poly(para-phenylene vinylene) (PPV)
- Polypyrrole (PPy)
- Polyaniline (PANI)
- Polythiophene (PT)
- Poly(3-hexylthiophene) (P3HT)

These polymers exhibit a wide range of **optical and electrical properties**, making them suitable for various applications.

3. Production Technology

Semiconducting polymers are synthesized using several methods:

- **Chemical polymerization**
- **Electrochemical polymerization**
- **Template-based methods**

The main stages of production include:

- Selection and preparation of monomers
- Polymerization reaction (often involving dopants)
- Purification and drying
- Application onto surfaces (via spin-coating, inkjet printing, drop casting, etc.)

Each stage has a significant impact on the final **electrical, mechanical, and optical properties** of the polymer.

4. Applications and Practical Uses

Semiconducting polymers are widely used in the following areas:

- Organic light-emitting diodes (OLEDs)

- Organic photovoltaic cells (OPVs)
- Organic field-effect transistors (OFETs)
- Biosensors
- Printed electronics

Due to their flexibility, these materials are also used in **flexible displays, smart textiles, and medical devices**.

Conclusion

Semiconducting polymers are considered one of the most promising materials of the 21st century. In-depth study of their production technologies can significantly contribute to the advancement of modern technologies. In the context of Uzbekistan, scientific research in this field holds particular importance and potential for innovation.

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