ABSTRACT

of dissertational work for a PhD degree of specialty 6D073900 – " Petrochemistry"
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The modified polymeric materials on the basis of hydrocarbon feedstock for the multi purposes

General description of the work. The present work is devoted to modification of polymers produced by petrochemical industries for the purpose of their further metallization and use as multi-purpose composite materials.

Relevance of the research. At present, the petrochemical industry in Kazakhstan is actively developing the production of industrial brands of unmodified polymers. At the same time, such materials are characterized by low values of surface energy, weak adhesion to different surfaces, which significantly limits the scope of their application.

In this respect, the development and commercialization of innovative technologies for the modification of basic grades of polymers, allowing to change the surface properties of materials, is more profitable and economically viable.

Surface modification of polymeric materials by radiation and plasma treatment gives the necessary hydrophilicity of the surface, allowing to avoid the etching operation by aggressive reagents. The application of an intermediate conductive layer by the gas phase method to form copper phosphide is an effective alternative to the use of expensive palladium, as is customary in the standard metallization of polymers.

Purpose and objectives of the study. The aim of the work is the development of new methods for surface modification of polymers for their subsequent metallization and use as metallized polymer pipes for transportation of oil products, as well as the possibility of using them as a matrix for supported catalysts for oil refining.

The following tasks were set and solved:

- development of optimal conditions for surface modification of polymeric materials by radiation and plasma-initiated treatment;
- research of supramolecular structure, composition and physicochemical properties of modified polymeric materials by modern instrumental methods;
- deposition of a conductive layer on the modified surface of polymers followed by chemical and galvanic metallization;
- study of the mechanism of formation of composite coatings containing uniformly distributed ultradisperse particles on a polymer basis, studying the structure and properties of the coatings obtained;
- research of operational properties and catalytic activity of the developed metallized polymeric materials.

Scientific and practical significance of the research.

Optimal conditions for the creation of modified polymeric materials based on industrial grades of polymers were developed by radiation and plasma-initiated

grafting on their surface of vinyl monomers with polar functional groups in order to give the surface the necessary degree of wetting. The polymer surface thus modified does not require etching by aggressive chemical reagents provided for by the classical polymer metallization technology.

For the deposition of intermediate conductive films, a gas-phase method was used to form copper phosphide, which avoids the use of palladium, as is customary in the framework of the classical technology of metallization of polymers.

The process of applying copper-phosphoric films can be combined with the simultaneous deposition of inert dispersed particles, which impart additional functional properties to the coating. The obtained conductive layer can be further will strengthen by the chemical and galvanic metallization.

The use of the developed modified polymeric materials coated with metals for the production of pipelines is environmentally justified and economically viable alternative to metal pipes, it allows to reduce material costs, increase reliability and durability of the product.

Methods of investigation: IR-spectroscopy of disturbed total internal reflection, transmission electron microscopy, X-ray phase analysis, scanning electron microscopy, differential scanning calorimetry, X-ray fluorescence analysis.

The conducted researches and the received scientific results allow to draw the following **conclusions:**

1. Optimal synthesis conditions were established and for the first time surface modified polymeric materials based on polypropylene and polyethylene of domestic production were obtained by radiation grafting and plasma activation, giving the surface the necessary degree of hydrophilization for subsequent coating with metal.
2. The possibility is substantiated and the technological characteristics of the non-palladium metallization of previously modified polymeric materials by depositing copper-phosphoric films are researched.
3. Mechanisms for the formation of metal coatings deposited by the gas-phase method on the previously hydrophilized by radiation and plasma modification of a polymer base, are proposed.
4. For the first time, a composite metallized coating on a pre-hydrophilized polymer was obtained by combining a gas-phase method of depositing conductive copper phosphide films with the simultaneous introduction of inert dispersed particles into the conductive coating composition followed by chemical and galvanic metallization of the polymer material surface using standard technology.
5. Developed on the basis of surface modified polymers, metallized polymeric materials can be recommended for the manufacture of pipelines used to transport petroleum products and as catalysts in liquid-phase oxidation reactions.

Applied nature of the developed metallized polymer materials expands the scope of application of polymer products of the domestic petrochemical industry and raises it to a qualitatively new level.