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STUDY OF THE PROPERTIES OF POLYETHYLENE COMPOSITE MATERIALS REINFORCED WITH LAYERED SILICATES

Composite materials based on layered silicates and polymer materials represent one of the most promising directions in modern materials science. Their unique physicochemical properties, such as high mechanical strength, thermal stability, barrier characteristics, and resistance to aggressive environments, open up wide opportunities for application in various industries.

Among these materials, particular attention is given to composites utilizing bentonite – a natural aluminosilicate mineral that possesses high adsorption capacity, plasticity, chemical resistance, and availability. These properties make bentonite an ideal filler for creating composite materials with enhanced characteristics.

However, the process of creating such composites is associated with a number of technological challenges. One of the main issues is the uneven distribution of clay particles in the polyolefin matrix, which is due to the difference in polarity of these materials. Polyolefins, such as polyethylene and polypropylene, are non-polar polymers, while bentonite has a polar nature. This leads to poor compatibility of the components, the formation of agglomerates, and uneven dispersion of the filler in the polymer matrix. As a result, the mechanical, thermal, and barrier properties of the final material deteriorate.

To address this problem, modification of bentonite clay is required to improve its compatibility with the polymer matrix. One of the most effective methods is the treatment of bentonite with organic modifiers such as ammonium salts. These compounds can intercalate into the interlayer space of the clay, increasing the distance between layers and reducing the surface energy of the particles. This, in turn, improves the dispersibility of bentonite in the polymer matrix and contributes to the formation of a more homogeneous composite structure [1].

Another challenge that complicates the process of creating composites is the high viscosity of polyolefins, especially at elevated processing temperatures. High viscosity hinders the even distribution of clay particles during mixing, negatively affecting the quality of the final product. To overcome this issue, it is recommended to use plasticizing additives that reduce the viscosity of the

polymer melt and facilitate the dispersion of the filler. Plasticizers also improve the technological properties of the material, such as flowability and processability, which is particularly important when producing products by extrusion or injection molding [2].

Additionally, to achieve optimal properties in composites, it is essential to carefully control mixing process parameters such as temperature, time, and mixing speed. This helps minimize agglomeration and ensures uniform distribution of the filler in the polymer matrix.

An important aspect is also the selection of bentonite type and its preliminary treatment. For example, using purified and activated bentonite can enhance its interaction with the polymer matrix and increase the effectiveness of modification. In conclusion, it can be noted that composites based on layered silicates and polymer materials have significant potential for application in various fields such as packaging, automotive engineering, construction, and electronics. However, to realize this potential, it is necessary to solve a number of technological challenges related to improving component compatibility, optimizing mixing processes, and using modifying additives. Further research in this area will allow for the development of new materials with improved properties and expand their practical applications.

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THE EFFECTIVENESS OF STANDARDIZATION, TECHNICAL REGULATION AND CERTIFICATION

Standardization plays a very essential role as it affects all spheres of human life and ensures the efficiency of economic, financial and production processes. The constant expansion of international trade and the need for closer cooperation in science and technology led to the founding of the International