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THE EFFECT OF TALC AND KAOLIN FILLERS ON THE BENDING TEMPERATURE OF POLYPROPYLENE COMPOSITES UNDER LOAD

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Annotatsion: During the development of polypropylene composites filled with talc and kaolin, the influence of the type and amount of these fillers on the physical and mechanical properties of local polypropylene was studied.

Keywords:polypropylene, composite, influence, mechanical properties, talc, kaolin, temperature.

Introduction

Nowadays, the automotive industry is rapidly developing on a global scale. In this field, great attention is being paid to issues such as reducing the weight of vehicles, increasing fuel efficiency, decreasing the amount of waste, and also cutting production costs. Polymer composite materials (PCMs) play an important role in achieving these goals.

Polymer composite materials (PCMs) are modern materials based on polymers, with improved strength and other properties, consisting of two or more substances. Their main component is the polymer matrix, which serves as the primary base. Various reinforcing agents are added to this polymer (for example, glass fibers, carbon fibers, metal particles, talc, kaolin, natural or synthetic fillers).

Polymer materials play a very important role in the automotive industry because they are:

- lightweight (compared to metal),
- corrosion-resistant,
- inexpensive,
- easy to process,
- convenient for design.

Below are the most commonly used polymer materials in the automotive industry (Table 1):

Table 1

Polymer materials commonly used in the automotive industry

№	Polymer Name	Brief Description and Applications
1	Polypropylene (PP)	The most widely used polymer. Bumpers, panels, interior parts.
2	Polyethylene (PE)	High chemical resistance. Pipes, containers, shelves.
3	Polyamide (PA, Nylon)	Strong, oil and heat resistant. Engine parts, gears.
4	Polycarbonate (PC)	Transparent, impact resistant. Headlight lenses, interior lights.

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5	ABS Plastic (ABS)	Good appearance, durable. Dashboard panels, steering wheels, protective covers.
6	Polyurethane (PU)	Elastic, maintains shape well. Seats, other soft parts.
7	Polyvinyl chloride (PVC)	Elastic and attractive. Coatings, interior decorations.

Polypropylene and Its Properties

Polypropylene (PP) is a high molecular weight thermoplastic polymer that is extremely lightweight, chemically resistant, corrosion-resistant, and easy to process. Due to its relatively low production costs and ease of processing, it is widely used in various industrial sectors, including the automotive industry.

However, ordinary polypropylene lacks sufficient mechanical and thermal durability. Therefore, to improve its properties, reinforcing fillers (such as glass fibers, carbon fibers, talc, kaolin, mineral particles) are added to create composite materials. These materials are not only strong but also resistant to high temperatures and impacts, making them ideal raw materials for automotive parts.

Composite materials based on polypropylene are used in the production of various automotive parts. Below are the main application areas:

Bumpers and exterior body parts: Due to their high impact resistance, flexibility, and light weight, polymer composite materials (PCMs) are ideal solutions for exterior panels.

Interior cabin parts: Components such as instrument panels, inner door parts, plastic trim panels, and air or air-conditioning ducts are made from PP composites.

Trunk parts and mounting elements: Lightweight, durable plastics are used to reduce weight and costs.

Fluid containers and pipes: Due to polypropylene's chemical resistance, it is suitable for fuel and oil containers, brake fluid reservoirs, and similar parts.

It is known that composite polymer materials based on polypropylene are widely used in industry due to their ability to operate within a wide temperature range, both low and high. Local polypropylene-based composite materials are characterized by good resistance to elongation, compression, and impact, while the components are relatively inexpensive [1-7].

Objects and Methods of Research

The materials required for the research were obtained from “UzKorGas Chemical” LLC, including locally produced J-370 grade polypropylene (PP), imported talc currently in use, and locally produced kaolin of grade AKT-10 from the “Angren Kaolin” plant.

Results and Discussion

The amount of filler is gradually increased step by step. The composition of the composite materials based on locally produced polypropylene and kaolin, prepared for the experiment, is presented in Table 2.

Table 2

№	Parameter	Testing Methods	PP 95 % Talk 5 %	PP 90 % Talk 10 %	PP 85 % Talk 15 %	PP 80 % Talk 20 %	PP 75 % Talk 25 %	PP 70 % Talk 30 %

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			PP 95 % Kaolin 5 %	PP 90 % Kaolin 10 %	PP 85 % Kaolin 15 %	PP 80 % Kaolin 20 %	PP 75 % Kaolin 25 %	PP 70 % Kaolin 30 %
1	Yuklama (1,8 MPa) ostida egilish harorati, °C	ISO 75-1	52,1	54,3	54,8	55,13	58,6	60,7
2			51,02	52,68	52,9	53,6	54,11	55,2

The changes in the physical and mechanical properties of polypropylene composites with talc and kaolin in relation to the filler content were determined (Figure 1).

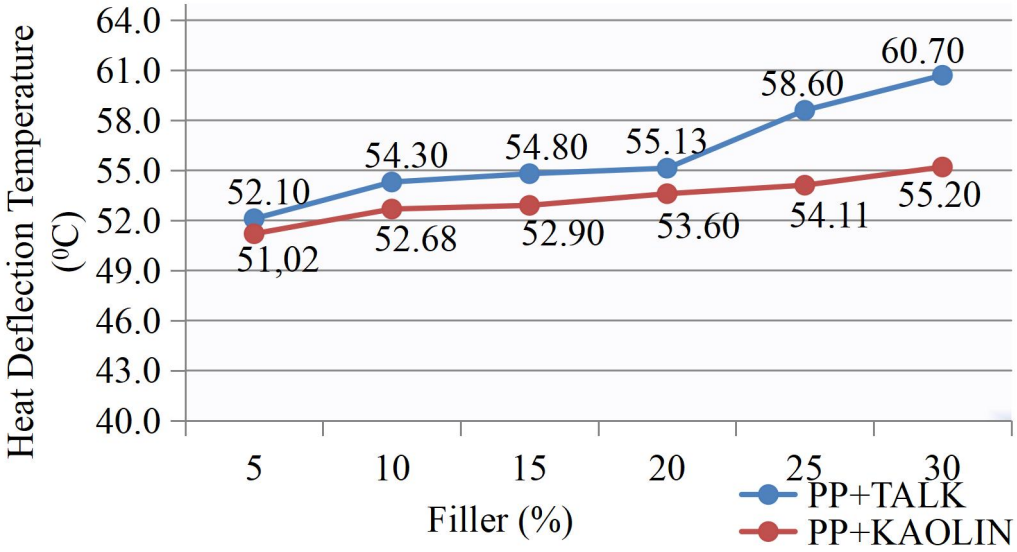

Figure 1. Graph of the change in filler content in polypropylene composites with talc and kaolin versus bending temperature under load.

Figure 1 shows the change in bending temperature under load of composite materials depending on the filler content. As can be seen, the bending temperature under load for composites with 5% talc and kaolin is 52.1°C and 51.2°C, respectively, representing an average decrease of 2-3%.

Conclusion. Polymer composite materials based on polypropylene are widely used in the automotive industry and are considered promising and efficient raw materials. The results of the above research indicate that locally sourced kaolin can replace imported talc as a filler. Furthermore, the composite materials with local kaolin exhibit optimal physical and mechanical properties, which serve as a basis for determining the best parameters for molding under pressure.

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