INFLUENCE OF COMPOUND FILLED WITH KAOLIN ON MELT FLOOD

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Annotation

In this work, the physical properties of a composite polymer mixture of polypropylene (PP) with the addition of kaolin powder with a grain size (23 μm) were investigated. The polymer composite was prepared by mixing polymer blend (PP) with (5/10/15/20/25/30) wt.% kaolin powder to obtain the desired properties.

Keywords: mechanical properties, polypropylene, kaolin, mixture, filler, elasticity.

INTRODUCTION

In many areas of human activity around the world, natural materials have been replaced by synthetic ones, which have become widespread due to their lower cost and wide variety of properties. Another important advantage of synthetic materials is the possibility of further improving existing ones, creating new materials and technologies for their production by selecting raw materials, their ratio in the raw material mixture, called composition, and technological parameters. This makes it possible to optimize the properties of synthetic materials for specific operating conditions and expand the possibilities of their use by obtaining materials with a set of new technological and operational properties.

The most promising from the point of view of further development of technologies for production and subsequent application are composite materials or composites, which include materials consisting of two or more components, the quantity of which must be comparable

and lead to the formation of the required structure and properties. In this case, one of the components, called the matrix or binder, constitutes a continuous phase in the material, in which other components, called fillers, are distributed. [1]. Recently, polymer composite materials (PCMs), in which a polymer in its pure form or a polymer binder acts as a matrix, have become increasingly widespread and developed. A polymer binder is understood as a composition based on a polymer with the addition of various additives, such as plasticizers, stabilizers, solvents, etc. [2].
Thermoplastics, in turn, are characterized by higher impact strength, crack resistance, lower residual stresses and chemical shrinkage than thermosets, as well as the possibility of recycling and the absence of solvent release. In addition, thermosets are characterized by fragility and a longer molding cycle due to the occurrence of curing reactions, while thermoplastics are characterized by unlimited viability of raw materials and semi-finished products due to the absence of curing reactions. However, thermoplastics are characterized by faster aging (irreversible deterioration of properties under the influence of the environment) [3], higher viscosity of solutions and melts. It should also be taken into account that thermoplastics are divided into amorphous and partially crystalline polymers.
In recent years, polypropylene has established itself as one of the most interesting commercial thermoplastics. Because polypropylene (PP) is widely used in many scientific, industrial and everyday applications as it is a versatile and inexpensive material.
In general, the physical and mechanical properties of polymer composites with dispersed fillers strongly depend on the size, shape and distribution of filler particles in the polymer matrix, as well as on the degree of interfacial adhesion between the filler and the matrix [4,5].
The purpose of this work was to develop a new type of PP mixtures filled with local Angrensik (Uzbekistan) kaolin as a filler, to determine the mechanical and physical properties of filled and unfilled PP mixtures, and to study the effect of filler particle size on the mechanical mixture.

Objects and methods of research

In this work, the physical and mechanical properties of mixtures of PP and kaolin were studied. The PPs used for this study were supplied by Uz-Kor Gas LLC. The kaolin used in this work is produced in Angren (Uzbekistan) by Angren Kaolin LLC.
Previously, all PP components and kaolin were mixed manually for 15 minutes and then loaded into a laboratory twin-screw extruder. The barrel temperature was monitored and controlled by a thermostat. The head temperature was also controlled by a thermostat and adjusted along with the cylinder temperature to ensure uniform output. Temperature is measured in different zones of the extruder. The extruder produced monofilament with a diameter of 2 mm, which was cooled in air. The monofilament produced at screw speed (85 rpm) was uniform and opaque; it was cut into granules (3-4) mm long. Samples for testing different particle sizes (25) microns of

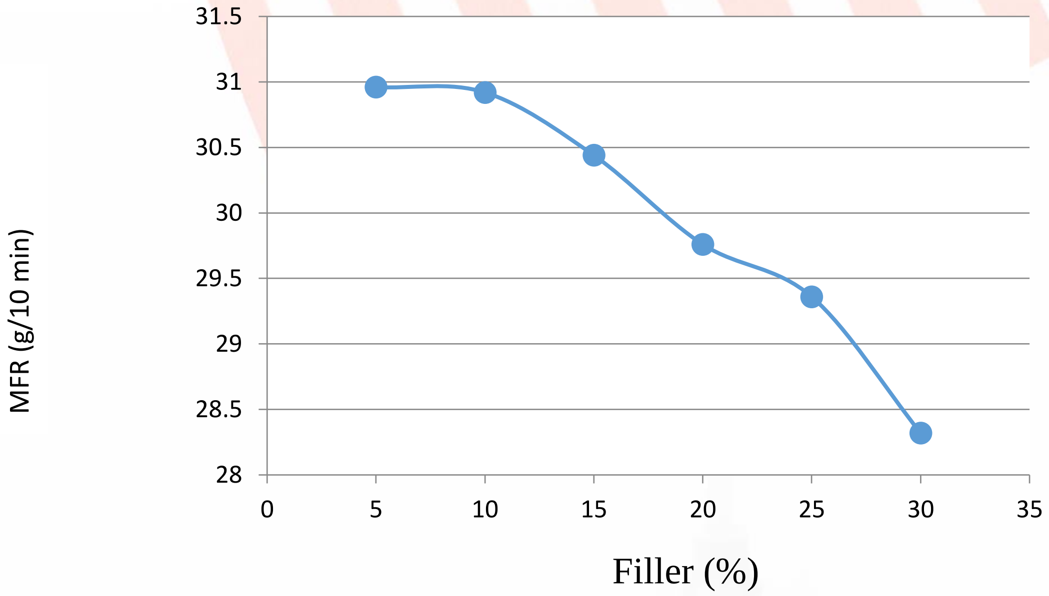
filler were manufactured by injection molding at a temperature of 220-240°C. The resulting samples were kept at a temperature of 23°C and a relative humidity of 50% for at least 40 hours to measure physical and mechanical parameters, in accordance with the requirements corresponding to ISO and GMW.

Testing of composites for PTR conductors according to ISO 1133 on a testing machine (Tinius Olsen MP 1200).

Pic.1. Tinius Olsen MP 1200

RESULTS:

Picture 2 shows changes in the MFI of the resulting compound depending on the kaolin content.



Pic. 2. Dependence of the MFR of the compound on the kaolin content

We can say that adding kaolin to the base PP leads to a decrease in MFI. For example, with a kaolin content of 5%, the MFR of the compound is 30.96 g/10 min, and increasing the kaolin content by 30%, the MFR of the compound decreased to 28.32 g/10 min. From the results obtained it is clear what is achieved by adding low-flowing kaolin (MFR = 1 g/10 min).

Conclusions

Based on the conducted research, the possibility of regulating the value of such an important technological indicator has been shown. It can be said that the addition of kaolin reduces the viscosity of the system in proportion to its proportion. Thus, other important characteristics of the compound can be adjusted to achieve goals.

LITERATURE

1. Колосова А.С., Сокольская М.К., Виткалова И.А., Торлова А.С., Пикалов Е.С. Современные полимерные композиционные материалы и их применение. Международный журнал прикладных и фундаментальных исследований № 5, 2018
2. Сокольская М.К. Связующие для получения современных полимерных композиционных материалов /М.К. Сокольская, А.С. Колосова, И.А. Виткалова, А.С. Торлова, Е.С. Пикалов // Фундаментальные исследования. –
№ 10–2. – С. 290–295, 2017.
3. Перфилов В.А. Строительное материаловедение. Технология конструкционных материалов: учебное пособие / В.А. Перфилов. – Волгоград: ВолгГАСУ. 104 с, 2014.
4. Thio Y. S., Argon A. S., Cohen R. E., Weinberg M. "Toughening of isotactic polypropylene with CaCO3 particles". Polymer, Vol.43, No. 13, PP. 3661- 3674, 2002.
5. Da Silva A.L.N., Rocha M.C.G., Moraes M.A.R., Valente C.A.R and Coutinho F.M.B. "Mechanical and rheological properties of composites based on polyolefin and mineral additives". Polym. Testing ,vol. 21, No. 1, 57 – 60, 2002.