THERMAL CONDUCTIVITY OF POLYMER COMPOSITES AFTER ADDITIVE MANUFACTURING

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Polymeric materials and composites are widely used in many areas of technology and everyday life, replacing traditional materials in all areas of production and consumption. The main reason for their successful use is their ease of processing, high specific strength, low density, and dielectric properties. However, some properties of polymers and composites are significantly different from traditional materials, which significantly limits their potential use. These include flammability, thermal conductivity, heat resistance, and resistance to ultraviolet radiation. PCMs are used in compact electronic devices, as body parts and structural elements, and are widespread and modern. Most modern electronic devices generate and dissipate heat during their operation. Semiconductor light sources and mobile communication devices are widely used. The problem of low thermal conductivity of traditional PCMs has been known for a long time. The use of composite materials with increased thermal conductivity is widespread [1]. The thermal conductivity of composites is described by the percolation theory similarly to electrically conductive composites [2].

Fillers with a high intrinsic thermal conductivity, such as metals, mineral and synthetic fillers, namely copper, aluminum, graphite, boron nitride, are successfully used in thermally conductive composites. An important feature of thermally conductive fillers is the pronounced anisotropy of thermal conductivity depending on the direction of heat propagation [3]. Polymeric composite materials made from such fillers are significantly affected by the orientation of particles on thermal conductivity properties. During the production and processing of such composite materials, the orientation of the

filler particles along the action of shear stress is realized. The shape of the filler particles has a significant impact on the thermal conductivity of composites.

Additive manufacturing or 3D printing is a modern approach to the production of products by adding material in layers using software control and based on a software model. In modern conditions, additive manufacturing is a common production technology that is widely used for the manufacture of products where there are requirements for thermal conductivity. In particular, housing and structural parts of electronic devices, small aircraft, military equipment, and supplies are mass-produced.

The aim of the study is to investigate the thermal conductivity of existing composite materials for additive manufacturing, which will allow optimal use of their properties in applications where thermal conductivity is an important factor.

References

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