APPLICATION OF CARBON COMPOSITE COATINGS FOR THE CREATION OF ELECTROMAGNETIC RADIATION REFLECTION SURFACES

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Polymer coatings are widely used in many areas of technology and everyday life. In some applications, it is necessary to provide polymer coatings with certain electrical properties. Polymer coatings are known to have antistatic, dissipative, and electrically conductive properties depending on the level of their specific surface resistance.

Electrical properties can be imparted by using conductive polymer matrices or by creating composite materials with conductive fillers. The electrical conductivity of composite materials containing a conductive filler is explained by the formation of contact conductive chains between particles, which is described by the percolation theory [1].

Typical fillers that provide electrical properties are metals and various carbon materials. Metal fillers for coatings can be powders with high dispersion or nanoparticles, and particles in the form of scales and fibrils are known to be used [2]. Metallic fillers are characterized by high density and cost, as well as a tendency to sedimentation and surface oxidation.

Carbon conductive fillers are characterized by relatively low density, availability and low price, and lower oxidation ability.

The literature contains numerous examples of the use of conductive composite coatings for a number of functional applications, in particular, heating elements, antistatic coatings, electromagnetic shielding, creation of galvanic coatings, and others.

In the course of the research, composite coatings based on polyvinyl butyral and nitrocellulose containing hybrid fillers based on crushed natural graphite

and carbon black made from acetylene were created. The composite coating based on these components has a valuable set of consumer properties at a filling level of 50 to 70 mass percent. The created coatings have a typical value of specific surface resistance in the range from 1 to 50 ohms per square.

When studying the properties of composite coatings, it was proposed to investigate their ability to reflect and transmit electromagnetic radiation. The study was carried out using a spectrum analyzer equipped with an oscillating generator and an antenna complex based on horn antennas.

It was found that composite coatings with a low surface resistance value in the range of 1-10 ohms per square have the ability to effectively reflect electromagnetic waves in a wide range of wavelengths. The reflection efficiency ranged from 96 to 98 %.

The investigated coatings were proposed to be used for applying to the surface of models imitating military equipment made of dielectric materials.

The coatings were applied by air spraying on models made of laminated wood composite and covered with a protective coating that had a protective color. Tests showed the effectiveness and feasibility of the coating.

References

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