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## «Technological basis for the synthesis of polymer composite on the basis of highly filled with tungsten oxide polyimide matrix»

R N Yastrebinsky, Z V Pavlenko and A V Yastrebinskaya

# Problem statement

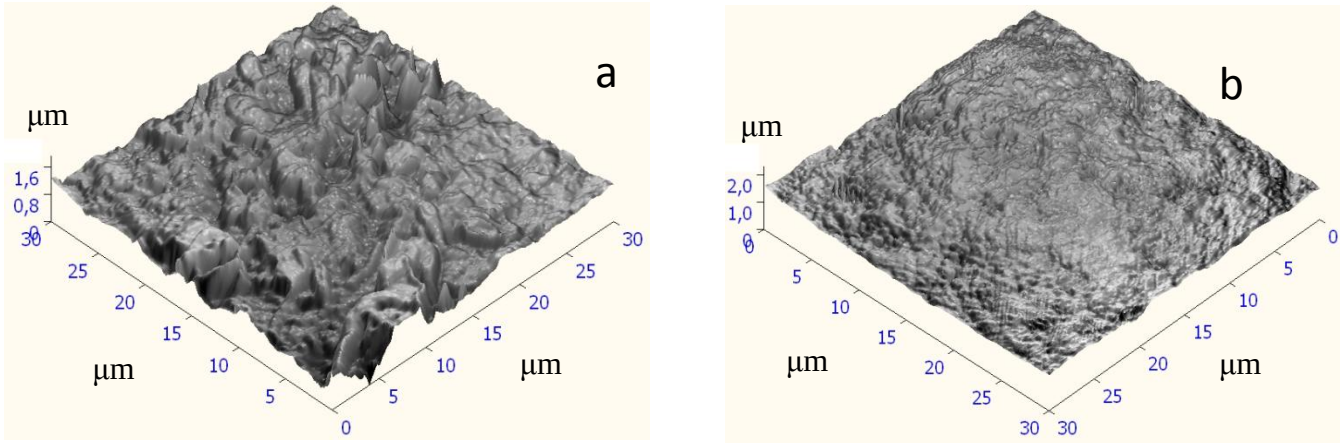
Despite extensive studies of polyimide composites (glass, carbon plastic) and Kapton-HN polyimide film from Du Pont (USA) for spacecraft, there are no data on the development of radiation protective polyimide matrices filled with tungsten (IV) oxide.

- In this work, probe microscopy of the surface of a filled polyimide composite and its density depending on the content of tungsten dioxide was studied.
- The optimal composition of the composite material is determined based on the data on the passage of ultrasonic waves in it.

# Solution methods

- As a radiation-protective filler, powdered tungsten dioxide with a bulk density of 12.1 g/cm3 and a dispersion of 0.2-10.0 μm, modified with polyethylsiloxane from a solution of n-hexane, was used.
- Thermoplastic polyimide in the form of press powder (particle size 2-5 microns) was used as the polymer matrix.
- The composite material was pressed at a specific pressure of 200 MPa with constant heating and holding at a temperature of 325 ºC, followed by quenching at 250 ºC and cooling to room temperature.
- The measurements of the propagation velocities of ultrasonic waves were carried out in a pulsed mode at a frequency of 35 kHz.

# Conclusions




3D topography of the surface of a polymer composite with unmodified (a) and modified (b) tungsten dioxide

- When creating radiation-protective composites, an increase in packing density leads to an increase in the protective characteristics of finished products.
- The use of a modified filler made it possible to increase the degree of filling of the polyimide composite by 15–20% compared with unmodified tungsten dioxide with the same strength of the composite.
- The optimal degree of filling of the polyimide composite with modified tungsten dioxide, which is 65% of the mass.

# Contacts

R N Yastrebinsky

Belgorod State Technological University named after V.G. Shukhov, 46, Kostyukova str., Belgorod, 308012, Russia

E-mail: yrndo@mail.ru