Overview of the 18th International Scientific and Technical Conference Rapid Solidification Materials and Coatings

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Abstract. In this preface the main results of the 18th International Scientific and Technical Conference Rapid Solidification Materials and Coatings that was held on 19–20 October 2021 in Moscow, Russia are discussed.

From 19 to 20 October 2021, the 18th International Scientific and Technical Conference Rapid Solidification Materials and Coatings (RSMC–2021) was held at the Moscow Aviation Institute (National Research University). Despite the difficulties associated with the coronavirus pandemic, more than 100 specialists from leading universities, the Russian Academy of Sciences and Russian enterprises, as well as scientists from Ukraine and Belarus, took part in the Conference. For the successful holding of the Conference in a pandemic, all the necessary measures were taken to ensure the implementation of sanitary rules and standards for the protection of Conference participants.

At the Conference the results, which were obtained in the last year after the previous Conference, of the theoretical and experimental studies on the physics of condensed matter, low-temperature plasma physics, electronic and ion-plasma surface modification, physical methods of film deposition and other studies obtained over the last year after the previous Conference.

The main objects of these studies were superficiality and superficial phenomena. Therefore, to the development and improvement of methods of surface modification and coatings deposition, as well as methods of their research and development of modern surface treatment equipment was paid the greatest attention at the Conference.

During the Conference more than 70 reports were presented, which were heard in the following, traditional Conference sections (figure 1):

• section 1 – Rapid solidification materials;
• section 2 – Methods of coating application and research;
• section 3 – Laser, electron-beam and ion-plasma methods of surface modification;
• section 4 – Composite materials and permanent joints;
• section 5 – Works of young scientists.

The Conference was opened by Alexander Vladimirovich Bespalov, Co-Chairman of the Director of the Department of Materials Science and Materials Technology of the Moscow Aviation Institute (National Research University), who emphasized the importance of developing research in the field of
physical and physicochemical methods of obtaining and processing new materials and coatings for the aerospace industry. He also noted the achievements of the Institute’s scientists in the field of laser coating and fast solidification materials.

Figure 1. Working sessions of the Conference.
Plenary reports of the Conference were devoted to theoretical and practical aspects of microarc oxidation of Al and Mg alloys, mechanisms of formation and properties of nanocomposite coatings based on oxides of zirconium, hafnium and aluminum in plasma processes.

Of interest is a new approach to studying the features of the propagation of quasi-monochromatic optical fluxes through a thin flat transparent layer of a multilayer coating. It is shown that these fluxes can be transported by a layer in the course of its multiple sequential total internal reflection or by a waveguide-resonant propagation method. A combined surface treatment of metals by electrolytic-plasma diffusion saturation and polishing was also presented.

A number of reports presented the continuation of research on the use of inverted magnetrons for the deposition of composite multilayer coatings on substrates of complex shapes. Further development of the method for visualizing the deformation of materials arising under the action of laser pulses using mechanoluminescent coatings is proposed. A number of reports were devoted to the continuation of research in the field of microarc oxidation.

New approaches to the description of electronic and proton processes of multiple scattering in solids are presented.

Considerable attention was paid to reports on the formation of nitride protective coatings by vacuum-arc and magnetron methods, as well as the residual stresses arising in them.

The reports on various aspects of obtaining fast solidification materials aroused great interest among the Conference participants.

**Figure 2. Summing up the results of the 18th International Scientific and Technical Conference Rapid Solidification Materials and Coatings.**

Summing up the results of the Conference (Figure 2), the participants noted the high level and wide range of topics of reports on topical issues of the formation by physical and physicochemical methods of surface layers of products with specified properties, the creation of industrial equipment and technologies.

Thus, the 18th International Scientific and Technical Conference Rapid Solidification Materials and Coatings (RSMC–2021) contributed to the further development of this scientific and applied research area and the expansion of professional ties of the participating scientists.
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