

## Preface

The latest trend in the creation of new modern materials with record operational characteristics when working in extreme conditions is associated with the research and development of nanostructured materials and nanotechnologies.

The monograph offered to the reader presents the results of the authors' research in the development and practical implementation of the latest nanomaterials and nanotechnologies Avinit to improve the performance of materials.

The developed vacuum-plasma nanotechnologies of Avinit are based on the use of gas-phase and plasma-chemical processes of atomic-ion surface modification and the formation of functional nanolayer coatings.

A distinctive feature of these works is the implementation of complex vacuum-plasma coating methods (plasma-chemical CVD, vacuum-plasma PVD (vacuum arc, magnetron), ion saturation and ionic surface treatment processes) under the action of a nonequilibrium low-temperature plasma, combined in one technological cycle.

The experimental and technological equipment created for these purposes – the Avinit vacuum-plasma automated cluster – makes it possible to implement complex methods of applying multicomponent coatings (mono- and multilayer, nanostructured, gradient) for various functional purposes (antifriction, strengthening, etc.).

The monograph presents the results of the authors' research from conducting broad fundamental research to the development of pilot technologies and their serial implementation in the most modern industries – aviation, mechanical engineering, power engineering, instrument making, rocket and space technology.