

Preface

Among the technologies of efficient use of resources, the group of thermal spraying methods is intensively developed. Studies from the standpoint of gas dynamics, heat transfer, mechanics, metallurgy, and physical chemistry allowed reliably reflection of the processes of motion, the heating of the particles, and their contact with the substrate, studying the structure and properties of coatings applied to the flame, plasma, detonation spraying. Great contribution was made by V.A. Barvinok, M.A. Belotserkovsky, G.V. Bobrov, Y.S. Borisov, V.S. Klubnikin, V.V. Kudinov, S.V. Petrov, A.F. Puzryakov, and others. On this basis, the equipment and the technologies were developed to produce coatings of stable and high quality.

In this group of methods, the Arc-Sprayed coatings are 3–10 times cheaper than the coatings produced by other methods according to the relative costs. Currently, arc spraying takes more than 20 % of the market of thermal spraying coatings, which has been developed dynamically over the last decade. However, its development is constrained by poor quality of the obtained coatings. This is due to the method specificity, which is expressed in a combination of a powerful influence on the sprayed material of the carrier gas, similar to other methods of thermal spraying, and the arc, spraying similar to the arc welding processes. This combination leads to rapid oxidation and splashing of sprayed metal.

Current state of researches does not reflect physical and chemical processes in arc spraying accurately, fairly and adequately. It makes it impossible to improve purposefully the equipment and technologies for this method, to predict the chemical composition and properties of the coatings.

This paper deals with the development and systematization of modern representations of the arc-spraying method. The processes of forming the droplets from the sprayed metal by the influence of the arc, movement, heating along the spraying distance, the chemical interaction of spray material and a gas phase and oxygen supply into the droplets. The interrelation of the processes with the properties of the obtained coatings was distinguished. On the basis of these studies, the possible ways of improving the equipment and improving the properties of the coatings were analyzed; and the proposals for their implementation were developed.

This monograph is the result of co-work of experts who have successfully engaged in the study of high temperature metallurgical processes and in the practical implementation of arc spraying in various branches of industry.

The monograph is designed for scientific and engineering specialists who are engaged in the field of welding and thermal spraying. It can also be used by students, undergraduates, and graduate students who are trained in relevant specialties.

The authors deeply appreciate their colleagues at the Department of Welding Technology, from the Ural Federal University, especially Shalimov M.P., Shanchurov S.M., Shumyakov V.I., as well as employees from the sided organizations Gudnev N.Z., Mishin V.M. (“Uraltransmash”, Ekaterinburg), Lukanin V.L. (“Novator”, Ekaterinburg), Pryadko A.S., Cherepko A.E. (Joint Institute of Mechanical Engineering, Belarus), Baranovsky V.E. (Unique Coat Technologies, USA) for their valuable comments during the discussion of materials and participation in bringing the experiments.

Fundamentals of Arc Spraying

Physical and Chemical Regularities

Boronenkov, V.; Korobov, Y.

2016, XI, 256 p. 180 illus., 33 illus. in color., Hardcover

ISBN: 978-3-319-22305-6