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CONFERENCE ON METALLIZATION IN PROTECTIVE ATMOSPHERES

(USSR)

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CONFERENCE ON METALLIZATION IN PROTECTIVE ATMOSPHERES

(USSR)

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The Metallization Committee of the Leningrad Section of the NTO [nauchno-tekhnicheskiy otdel -- Scientific Technical Section] Mashprom [machine industry] and the Leningrad House of Scientific Technical Propaganda conducted a conference in December 1958 on metallized covering obtained in an atmosphere of a protective gas. Participating in the conference were representatives from factories, scientific-research institutes and laboratories of Leningrad, and other cities.

Two papers were read: by engineer M. D. Nedzel'skiy (Irkutsk Mining Metallurgical Institute), and by candidate of technical sciences Ch. S. Yakimavichus (Kaunas Polytechnical Institute).

Dwelling briefly on the modern level of the expansion of metallization, engineer M. D. Nedzel'skiy mentioned that considerably improved properties of metal dust may be attained through the establishment of conditions which prevent oxidation of the pulverized metal. With this in mind, the author conducted a series of experiments employing 15 different powder materials, hot liquids, and gases.

Of all of the different protective mediums for metalization tested by the author, the best results were obtained from the use of generated gas and exhaust gases from internal combustion engines.

Instead of forcing air through the jet sprays, generated gas was used. The operating conditions were normal; the material was steel wire 10, diameter 17.8 mm, current 100 amperes, voltage 30 volts; distance from the fusing focus of the wire to the metallized surface was 75-100-150 mm, gas pressure was 5 atmospheres; internal diameter of the jet - 5 mm. The chemical composition of the gas: CO = 20%; CO_2 = 9%; H_2O = 3%; H_2 = 2%; the remaining quantity was N_2. Preparation of the surface was made in the form of a ragged threading with sand-blasted processing.

In testing the metallic covering, the following was determined: the plasticity of the pulverized layer, porosity, adhering quality of the layer with the metal of the basic form, microstructure and roentgen-structure of the powder.

Engineer M. D. Nedzel'skiy also acquainted the conference with experiments conducted on the utilization of internal combustion engine exhaust gases obtained during the running of an automobile engine.

In comparing the physico-mechanical properties of steel powders obtained during the utilization of exhaust gases, it turned out that they were better than "atmospheric" ones, but somewhat worse than the metallic coverings obtained with the use of generated gases.

Candidate of technical sciences Ch. S. Yakimavichus spoke about experiments being conducted on electrometallization with the use of a combined air-nitrogen stream.

Ch. S. Yakimavichus mentioned that one of the real deficiencies in the electrometallization-by-powder methods is the oxidation of the metal, as well as the change in its chemical composition during the pulverization process which results in a deterioration of the adhesion of the metallized layer with the base, and, therefore, to a deterioration of its resistivity to corrosion.

The use of an inert gas during pulverization considerably increases the quality of the metallized coating.

Candidate of technical sciences Ch. S. Yakimovichus employed nitrogen as the inert gas. In the pulverization of stainless steel, there is no danger of its nitration because the nitrogen only increases the anti-corrosive properties of the steel and decreases its susceptibility to intra-crystal corrosion.

However, the use of only nitrogen for pulverization was not feasible in practice because considerable amounts of compressed nitrogen were required for the pulverization process.

The amount of nitrogen expended can be reduced to a considerable degree by a simultaneous decrease in the size of the jet, but this has a negative effect on decreasing the speed of particles prior to their striking and thus results in a sharp deterioration of all of the properties of the layer.

The solution to this problem was found by increasing the diameter of the jet to 6 mm and more, since the air stream emanating from a jet of such a large diameter carries the metallic particles only within the inner section of the flow of air.

The outside layers of air, free of metallic particles, serve only to overcome the resistance of the surrounding medium, i.e., to support the speed of the inner portion of the stream. In order to utilize this characteristic, it was suggested that a combination spray consisting of two concentric streams be utilized for the pulverization of the metal:

1) an internal one of small diameter containing nitrogen or other inert gas, and

2) an external one consisting of air, of a large diameter concentrically surrounding the inner one.

An examination of the layer properties obtained through the use of such a combined stream showed that the burning out of the chrome made from stainless steel Kh18N9 and carbon from carbon steel in this case was decreased by 33-45% in comparison with the burning out of chrome and carbon during pulverization by air alone.

The corrosive resistivity of stainless steel and aluminum, pulverized through the use of the combined air-nitrogen stream, was increased 3-4 times in comparison with the corrosive resistivity of similar layers pulverized by air.

It is necessary to mention that all of the above indicated results were achieved through the use, for the inner stream, of a combined stream consisting of 94% nitrogen and 6% oxygen. The pressure at which the external (air) stream leaves the jet has a secondary significance since a decrease in this pressure to 3-2.5 atmospheres practically has no effect upon the properties of the layer.

The combined air-nitrogen stream process may have an industrial application in all instances where there is a need to obtain a metallized layer with the least oxidizing content, particularly during the dusting of stainless and other highly alloyed steels and alloys.

Also appearing at the conference were comrades Suprun, Yelin, Shevchenko, Tyur, Dilkov, Pigunov, Bulkin, and others, who made mention of the great significance of the tests conducted by engineer M. D. Nedzel'skiy and candidate of technical sciences Ch. S. Yakimavichus, as well as of the initiative portrayed by the Committee on Metallization in the exchange of experiences on the use of metallization in the field of protective atmospheres.

This initiative is even more significant in that metallization in protective atmospheres opens a series of new technical possibilities and expands the field of industrial use of metallization.

Particular attention in the lectures was devoted to the questions of the need for a wide popularization of metallization and the problems of bringing experimental operations closer to productive conditions with the aim of attaining the greatest practical results in industry.

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