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Formation of plasma technological influence of vacuum arc on the internal surfaces of metal pipes and putting of the protecting coatings

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The combination of bulk properties of one material with surface properties of another one in framework of uniform material is economic or technically necessary in many industrial applications. Treatment of products of inexpensive materials by the vacuum plasma arc for the obtaining of necessary new properties of the surface and interface layers is very perspective method in view of large efficiency of this process. However, there are no effective methods of treatment of internal surfaces of pipes and putting of the protecting coatings on them. It create the barriers for the use of cheap steel pipes in conditions with aggressive liquid components, with the enhanced pressures, with large temperature and with other parametres leading to increase of oxidation, erosion and to decrease of operation time of products.
The specific influence of arc vacuum discharge upon the material surface is caused by high energy concentration in rapidly moving cathode spot and by momentary local warming — up with subsequent prompt cooling. In this connection, the base of creation of plasma influence on the surface is the management of moving of the cathode spots. It provides of technological effect of plasma influence on the surfaces.In the present work the questions of the fixing of cathode plasma by opposite magnetic fields in the cases of coaxial electrodes and the problems of technological influence of plasma on the internal surfaces of pipes are considered. The developed system of the fixing of cathode plasma by the magnets placed in an internal space of the pipe-electrode forming an arch magnetic field for the trap of cathode plasma is described. The scanning by formed plasma mill on the internal surfaces of the pipes showed the high efficiency of the plasma vacuum arc method for the treatment of the internal surfaces of the pipes and putting of the coatings on them as such as for the achievements of necessary anticorrosive properties and other important parametres.

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