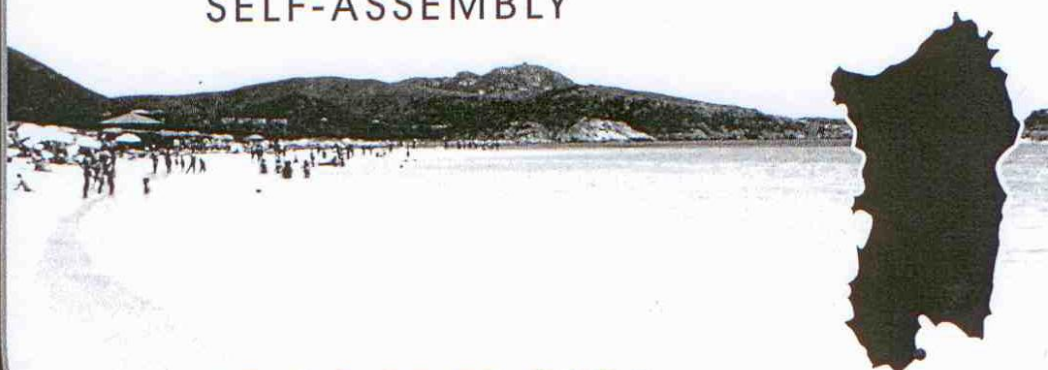


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Heat and erosion resistant nanostructured coatings for the gas turbine engines

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The increase of gas turbine engine effectiveness is related to the growth of parameters of their gas-dynamic cycle and, first of all, to the growth of gas turbine entry temperature and compressor pressure ratio.

This paper analyses the characteristics of functional coatings created by vacuum ion-plasma deposition. These coatings represent double- and triple-layer multi-phase multi-component structures, which are made by condensation of aluminium and titanium according to the given technology. The thickness of coatings is 20...40 μm . They were deposited on compressor blades and vanes manufactured from titanium alloy and chrome-nickel steel. In order to provide the necessary coating properties, the spraying was carried out in argon and nitrogen medium. During the first stage of the research, the analysis of microstructure and microhardness distribution was carried out. It gave the opportunity to confirm the qualities and structure of the coating. In particular, the microhardness of coating external layer exceeded 10 000 MPa, which provides high erosion resistance of a coating.

Then the comparative heat resistance tests for compressor blades and vanes with and without the given coating were carried out. The tests were carried out under the temperature of 780°C and up to the moment when first symptoms of blade surface destruction occurred, i.e. when corrosion products started to separate. These tests showed, for instance, that the time, during which the first symptoms of coated blade surface destruction had occurred, increased by 2...3 times when compared with blades without the coating. The test data made it possible to assert that the developed coatings can be used for a long time under the temperatures of 600...750°C (see Fig.1).

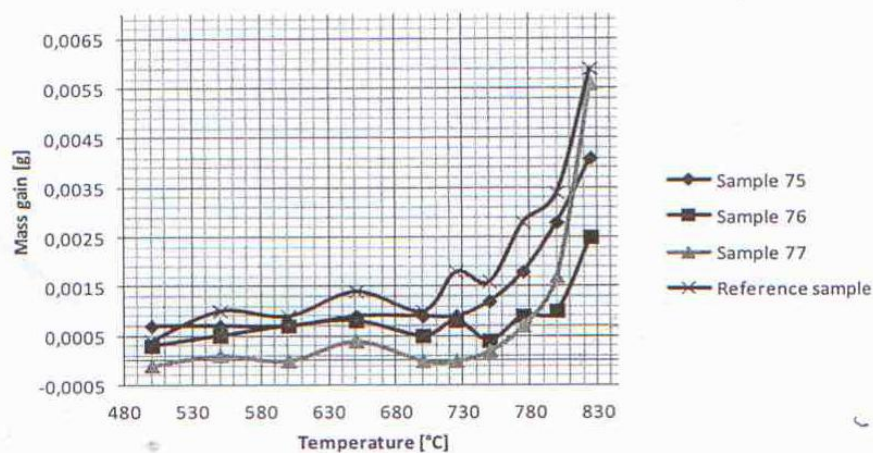


Fig.1 Mass gain depending on temperature