

Strength tests of ceramic heat-protective coatings for hot parts of GTE

Bychkov N.G., Nozhnitsky Yu.A., Avrutsky V.V., Pershin A.V., Khamidullin A.Sh.

P.I. Baranov Central Institute of Aviation Motors (CIAM)

Ceramic heat-protective coatings (HRC) along with the system of convection-film cooling are the important elements of the system protecting parts of the engine hot section from high temperatures. The cyclic life of parts and the safety of operation of an aircraft engine sufficiently depend on the strength characteristics affecting the performance of coatings.

A small amount of reliable data on the strength properties of individual layers of thermal protective coatings (HRC) makes it difficult to predict their operational characteristics (effectiveness of thermal protection, durability, etc.). Due to the difficulties in testing thin coatings with the “engine” thickness of the layers and in simulation of the operational loading conditions and temperatures, determination of the coatings properties are based on various simplified test methods.

The Federal State Unitary Enterprise “CIAM” had developed a set of methods to determine experimentally the strength properties of individual layers of HRC having real thickness and deposited by serial manufacturing technology. Experimental methods are based on tests of the simplest types of specimens under operational temperatures and loading conditions (Figure 1).



Figure 1 *Specimens to determine the strength properties of HRC layers*

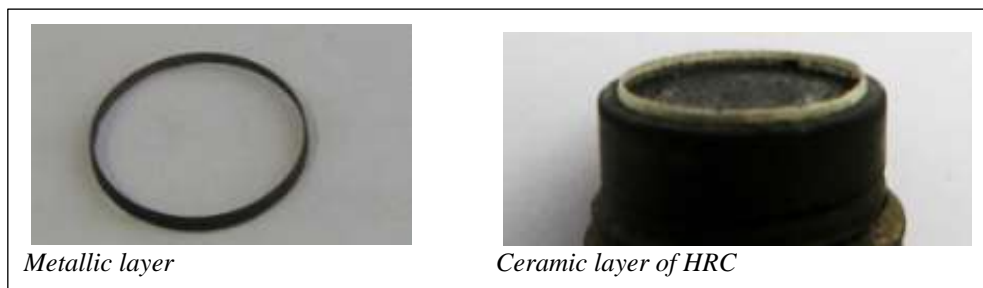


Figure 2 *Sublayer and ceramic layer of HRC after tests*

The methods proposed for the analyses of the individual HRC layers cohesive and adhesive strength at operating temperatures and loading conditions allow to optimize the coating characteristics (its composition, structure, etc.) at the early stages of HRC development for application in hot engine parts and details that operate under various conditions of thermal loads.