

THERMOPHYSICAL PROPERTIES OF INTERMETALLIC Fe-Al COATING DEPOSITED BY GAS DETONATION SPRAYING

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Methodology and results of thermophysical property (TP) investigation of the Fe-Al intermetallic coating created by gas detonation spraying (GDS) are discussed. Intermetallics are known for their unique mechanical and thermal properties and thus they are used as materials to be applied in constructional protective layers. Several techniques are usually utilized to apply such layers but a special protective barrier features can be achieved at GDS process. It is because the cyclic interactions of a two-phase, supersonic metalizing flux result in multiphase coating final structure. The structure contains both intermetallic phases and the oxide ceramics. However, the GDS process is sensitive to changes of the metalizing process parameters and for that reason properties of the protective layer parameters can vary also. This creates needs for punctilious studies of TPs of the produced coatings both for their characterization and for the GDS process optimization also.

At this particular instance TPs have been investigated for a coating produced of a Fe40Al metal powder (40 stands for a declared atomic fraction) at certain GDS process conditions. The measured parameters are: specific heat, thermal diffusivity and thermal linear expansion. The specific heat has been measured in the course of differential calorimetric studies by applying a Perkin-Elmer Pyris 1 apparatus. The thermal diffusivity has been investigated using a Netzsch LFA 457 instrument while the linear expansivity has been studied applying a Netzsch Dil 402 C dilatometer. All the measurements have been done at repeating heating/cooling cycles covering at least the temperature range from the room temperature to 600 °C. On the basis of the measured parameters the forth complementary parameter, i.e. the thermal conductivity has been calculated.

Analysis of the obtained results have proved effectiveness of the applied investigation procedures. In the course of the performed measurements all basic TPs have been obtained for the analyzed heterogeneous intermetallic coating. The developed methodology will be utilized in forgoing systematic studies of GD sprayed layers.

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