Type of presentation: Poster

MS-3-P-6008 Microstructure and phase modifications of CGDS and HVOF-sprayed CoNiCrAlY bond coats remelted by electron beam.

Gavendová P.[1], Čupera J.[1], Hanusová P.[1], Čížek J.[1], Dlouhý I.[1]

[1]Brno University of Technology, Faculty of Mechanical Engineering, Institute of Materials Science and Engineering, Brno, Czech Republic

Email of the presenting author: gavendova@fme.vutbr.cz

The paper deals with CoNiCrAlY coatings manufactured by the high-velocity oxygen-fuel (HVOF) and cold gas dynamic spraying (CGDS) deposition techniques and modified by electron beam (EB) remelting. HVOF and CGDS spraying method was applied in order to obtain very dense and good adhesive CoNiCrAlY-coatings deposited onto nickel-based alloy. The bond coat having thickness of about 70 μm. The electron beam remelting process is one of the most advanced convenient processes to reduce the main disadvantages of thermal spray coatings. The effect of high-energy electron beam surface remelting and microstructural modification in CoNiCrAlY bond coats have been investigated in this study. The electron beam remelting of both HVOF and CGDS – coatings has been proven to minimize the porosity and, in addition, modified the microstructure morphology and the phase composition of the CoNiCrAlY bond coats. Scanning electron microscopy, light microscopy and X-ray diffraction methods were performed to characterize the phase modifications and morphology before and after electron beam and thermal ageing treatment. The results obtained in this study could be summarised as follows: The pulsed electron beam surface remelting contributed to improvement of the bond coat to surface interface and, at the same time, to the refinement of this area. EB-treatment provided a smooth BC surface with low porosity level. The microstructure of the bond coat after this treatment has been is formed by Inconel fine grain layer being followed by the surface layer consisting of elongated dendritic microstructure. The longitudinal axis of dendrites has been oriented predominantly perpendicularly to the Inconel surface. Comparing to as-sprayed CGDS and HVOF coatings after standard vacuum heat treatment better operation properties are expected when using the EB remelting. The findings have also shown that bond coat achieved using low-temperature kinetic spraying appears to be perspective for practical applications.

Acknowledgement: The works have been partly supported by the financial support from the Operational Programme Education for Competitiveness no. CZ.1.07./2.3.00/30.0005 and within the project Netme plus centre (lo1202), project of ministry of education, youth and sports under the “national sustainability programme.

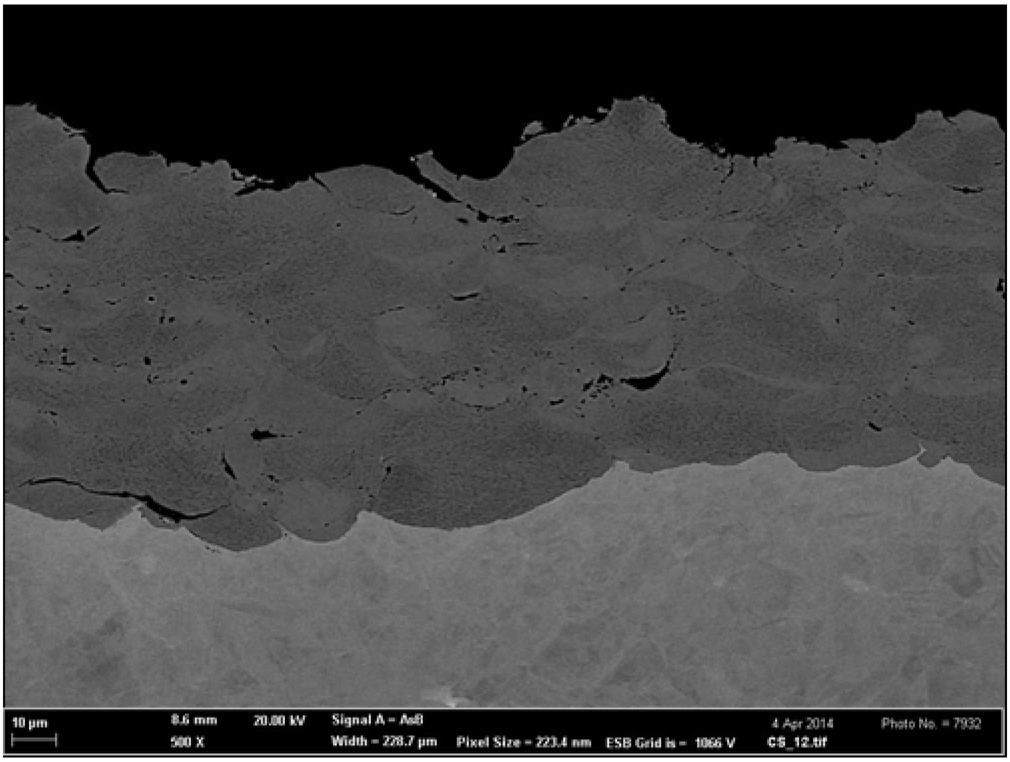

Fig. 1: CoNiCrAlY coatings before electron beam remelting.

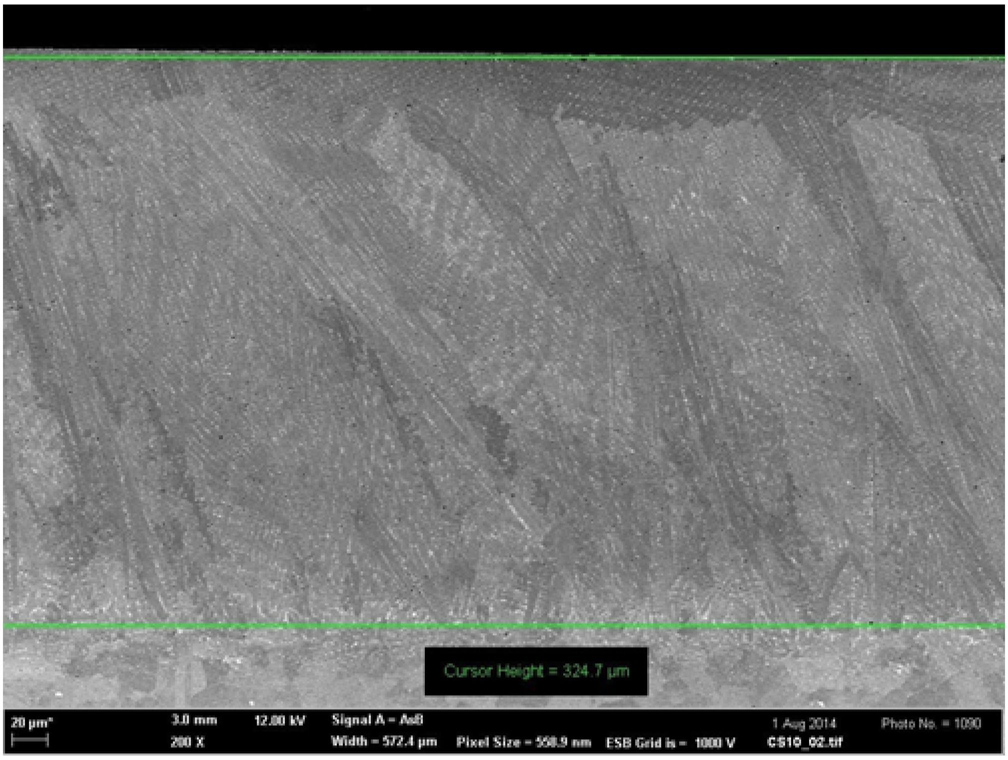

Fig. 2: CoNiCrAlY coatings after electron beam remelting.