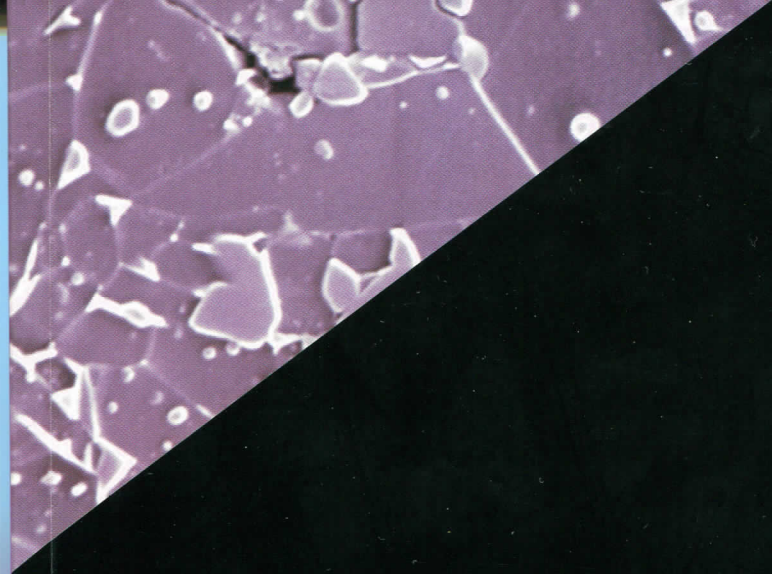

Advanced Research Workshop

Engineering Ceramics 2019

Ceramics for people

Book of abstracts

Smolenice castle, May 12-16, 2019

Poster presentation

Evaluation erosion resistance of metal-ceramics coatings

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Keywords: plasma transferred arc (PTA), flame spray (FS), erosion test, microstructure, coatings

Erosion of surface by solid particles causes a progressive loss of material, due to mechanical interaction of particles carried by the working fluid stream. Due to its deleterious effect on the surface erosive wear is a widespread type of wear which may provoke within a very short time a catastrophic failure and a rapid collapse in the structural integrity of industrial parts and components in of the thermal power plant.

There are several methods to protect parts from erosive wear and the choice of the deposition process depends strongly on the expected coating properties for the application and coating deposition cost. The most commonly used thermal spraying process is the flame spray (FS) process. Also, the plasma transferred arc (PTA) process is widely used.

The aim of the research was to study the structure and, the effect and influence of high-velocity/high energy erodent particles impact (about 100 m/s) and erodent impact angle (20-45°) on the erosive resistance characteristics of two different metal matrix protection coatings (MMC), WC/NiBSi and WC/NiCrBSi, applied by PTA and FS, onto the same substrate (low carbon steel S235JR). Also, the erosion mechanism of MMC coatings was studied.

Microstructure of cross-sectioned coatings was examined using scanning electron microscope (SEM) together with energy-dispersive x-ray spectroscopy (EDS). Hardness of the coatings was evaluated by means of the Vickers hardness tests. Erosion tests were performed on specially designed, in-house built, gas blast and erosion test facility and mass loss was measure.

Both types of MMC coatings with a similar chemical composition (WC/NiBSi and WC/NiCrBSi) (Fig.1a, b), and morphology of the filler materials (Fig.1c,d), deposited by different processes (PTA and FS), have different erosion resistance characteristics under the same erosion test conditions. The main reasons for such behavior are the content, form, composition and morphology of WC that are dispersed as a reinforcing material into metal matrix coatings (MMC).

Large carbides in the WC/NiBSi (Fig.1a) type of coating were more difficult removed from the metal matrix than the smaller carbides in the WC/NiCrBSi (Fig.1b), due to their stronger bonding with the matrix.

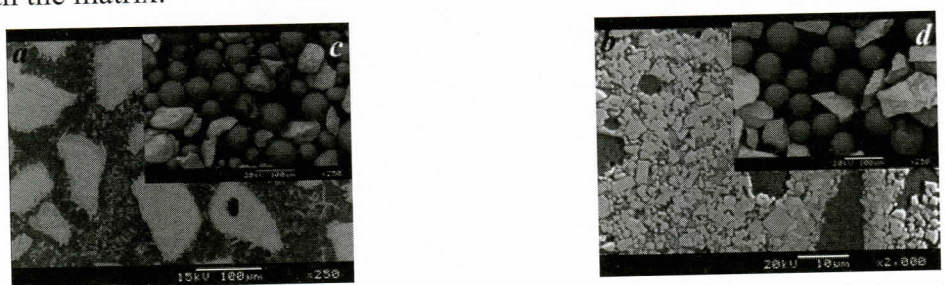

Fig.1. Microstructure of MMC coatings, a) WC/NiBSi, b) WC/NiCrBSi and c,d) morphology of applied filler materials, respectively.