**MAX phase compounds dual character highlighted by supersonic particles deposition**

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**Abstract:**

MAX phase compounds offer an attractive mixture of ceramic–metallic properties due to their covalent ionic–metallic nature. The processing of pure compounds as coatings by cold spray (CS), a novel cost-effective and productive spray technology used for industrial large-scale applications, is still considered a challenge. This is due to brittleness, internal delamination, and limited deformability of the MAX phase compounds. Utilizing CS, the hot gas-propelled material particles have ballistic impingement on a substrate where they can undergo plastic deformation. The work done at IRCER was to define the building-up ability of dense MAX-phase coatings by CS with retained structures and compositions, in close relation with the substrate characteristics and phase composition that influences the dual character ceramic–metallic behaviour. The originality of this research consists of pioneering deposition of Ti3AlC2 that emphasizes the ceramic–metallic character influenced by the particle speed and the mechanical properties of both substrate and compound. The dual character is revealed when the particle reaches sufficient kinetic energy to undergo plastic deformation (metallic like-behaviour) or fragmentation (ceramic like-behaviour). The deposition of Ti3AlC2 was performed using Impact Spray System 5/11, equipped with a SiC de Laval nozzle with an expansion rate of 5.60 mm and 160 mm length. The speed measurements data were built on Oseir HiWatch software and contain 500 images with 0.5 ns exposure time. The results showed that for higher pressure rate, the particles’ speed is increased, leading to better cohesion between particles on the substrate. The XRD patterns of the obtained coatings show the characteristic peaks of the Ti3AlC2 phase. The coating microstructure is rather homogenous, presents low porosity and no significant cracks are observed for the coatings obtained at different pressures. The interfaces between the substrate and the coatings are well-bonded along with the entire deposition.

**Biography of presenting author** (should not exceed 100 words)

Dr. Camelia Popescu studied Physics at University of Bucharest and graduated as MS in 2007. She has a PhD in Condensed Matter Physics obtained in 2012 and more than 11 years of experience in materials science nanostructured thin films by pulsed laser techniques at INFLPR, Romania. She started working at IRCER, France in 2019 in the field of thermal spray coatings of different materials. The results achieved during her professional experience were published in 26 ISI articles and 2 book chapters that gathered 284 citations and Hirsh index of 11.

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