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Characterization of HVOF Inconel 625 Coating by X-ray diffraction and Synchrotron XRD

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High-velocity oxy-fuel (HVOF) thermal spraying is also a common deposition method used, producing coatings of thickness ranging between 200 to 500 μm on engineering components. Despite the attention received by HVOF over the years, studies have shown that there is less attention given to the development of thick coatings for repair applications, most especially within the aerospace industry. Failure to produce thick coatings using HVOF methods is attributed to the residual stress build-up encountered when coatings are deposited. The residual stress build-up associated with the production of thick coatings is unavoidable [1, 2], and a major concern for the aerospace industry, since the performance and lifespan of coatings is influenced by the presence of residual stresses. In this paper, the investigation of depositing Inconel 625 of different coating thicknesses (250μm, 300μm, 400μm, and 500μm) using high-velocity oxy-fuel (HVOF) technique on 304 stainless steel (SS) substrate was conducted. The coating characterization was studied, to determine the best coating thickness to be applied on 304 SS substrates. The residual stresses of the as-sprayed coating were investigated using the Sin2ψ and Synchrotron X-ray diffraction (SR-XRD). The results indicate that the residual stressed have different nature despite using the same powder as feedstock. In addition, the magnitude of the residual stresses measured by X-rays was different from SR-XRD due to differences in their spatial resolution and gauge volume.

Reference:

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2. O.P. Oladijo, PhD Thesis, University of the Witwatersrand South Africa, 2013.

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