

Non-destructive Testing of Adhesion Defects in Ni-WC Coating by Focused Ultrasound using Phased-Array Probe and Active Infrared Thermography Methods

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Abstract

The substrate/coating adhesion is a crucial parameter conditioning the quality of coating and its durability in service. For this reason, a control of the coating integrity will be of great importance especially the presence of adhesion defects. The adhesion control is usually ensured by destructive methods, such as traction, interfacial indentation, four point bending, testing scratch, etc. However, it is currently hampered by the absence of a satisfactory non-destructive technique. Among the non-destructive testing technologies widely used in the industrial field, we find X-ray diffraction, ultrasound, infrared thermography, etc. In this paper, we are interested by two methods: the ultrasound, which is becoming more efficient, especially with the emergence of phased array systems and the active infrared thermography. To that end, Ni-WC coatings are deposited on a mild steel substrate by flame thermal spray technology and used as tested material. The coating thickness is about 1.3 mm. The control is performed on coatings, both without and with artificial defects (flat bottom holes with different diameters) at the interface to properly understand the interaction of ultrasonic and thermal waves with such discontinuities. An inspection using phased array probe and infrared camera has been proposed with the aim of showing the potential of these technologies in terms of detection, positioning and sizing of adhesion defects. A preliminary study was conducted in order to select the operating parameters that is, the number of excited elements and the focusing point. In this preliminary study, the acoustic field radiated by the phased array probe in the specimen is simulated using *in-situ* software named Atlas Sound. The different results are presented and commented.

Keywords

Substrate/coating adhesion; Non-destructive testing; Phased array; Defects detection, Active infrared thermography

Biography

Rachida Rachidi is a Phd student in the Equipe de Génie Industriel, Maintenance et Production mécanique, ENSA at the Mohamed 1st University, Oujda, Morocco. She holds a Bachelor of Science degree in Electronics from Mohamed 1st University and a Master of Science degree in Optics&Materials from the same University. His research interests include manufacturing of anti-wear coatings, simulation, optimization and non-destructive testing using focused ultrasound and active infrared thermography.