

Evaluation of Heterogeneity of Paint Coating on Metal Substrate Using Laser Infrared Thermography and Eddy Current

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Abstract : Non contact evaluation of the thickness of paint coatings can be attempted by different destructive and nondestructive methods such as cross-section microscopy, gravimetric mass measurement, magnetic gauges, Eddy current, ultrasound or terahertz. Infrared thermography is a nondestructive and non-invasive method that can be envisaged as a useful tool to measure the surface thickness variations by analyzing the temperature response. In this paper, the thermal quadrupole method for two layered samples heated up with a pulsed excitation is firstly used. By analyzing the thermal responses as a function of thermal properties and thicknesses of both layers, optimal parameters for the excitation source can be identified. Simulations show that a pulsed excitation with duration of ten milliseconds allows to obtain a substrate-independent thermal response. Based on this result, an experimental setup consisting of a near-infrared laser diode and an Infrared camera was next used to evaluate the variation of paint coating thickness between 60 μm and 130 μm on two samples. Results show that the parameters extracted for thermal images are correlated with the estimated thicknesses by the Eddy current methods. The laser pulsed thermography is thus an interesting alternative nondestructive method that can be moreover used for non conductive substrates.

Keywords : non destructive, paint coating, thickness, infrared thermography, laser, heterogeneity

Conference Title : ICNTE 2015 : International Conference on Nondestructive Testing and Evaluation

Conference Location : Paris, France

Conference Dates : May 18-19, 2015