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Laser-Ultrasonic Evaluation of Coatings

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The non-destructive characterization of coatings for thermal barriers, anti-wear or anti-corrosion coatings, is of particular importance for quality control, and can also be very useful for understanding the mechanical and thermo-mechanical behavior of parts allowing the development of life prediction models. Laser ultrasonics, which uses lasers for the generation and detection of ultrasonic waves, presents many advantages over conventional ultrasonic techniques for this application. The technique is non contact and can then be used on parts of complex shape that may be moving or at high temperature on a production line. Laser-ultrasonic characterization of WC-Co coating by surface acoustic waves providing elastic properties, density and thickness of dense coatings will be presented. The technique was also used to detect defects such as vertical cracks and coating disbonds. Larger amplitude ultrasonic waves or shockwaves generated by a more powerful laser allows adhesion measurement between the coating and the substrate. Recent results obtained on cold spray coatings of Titanium on Titanium will be presented. Of particular interest for cold spray coatings, metallurgical characteristics of coatings such as grain size and texture can also be probed by laser ultrasonics.

Submitted for presentation at the 2011 North American Cold Spray Conference to be held in Windsor, ON from October 25 to 27, 2011.

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Short Bio

Alain Blouin received a B.Sc, M.Sc. and Ph.D. in Physics (Optics and Nonlinear Optics) from Laval University in Canada. He then held a postdoc position at the Ecole Normale Supérieure in Paris, France, working on the instabilities in nonlinear optical systems.

A. Blouin is working in Optical Diagnostics at the Industrial Materials Institute of the National Research Council of Canada since 1992. At IMI, he has developed a new sensor for optical detection of ultrasound based on real-time holography in photorefractive crystals, which is now commercially available, as well as several technologies and industrial applications in the field of laser-ultrasonics. A. Blouin has published more than 25 peer-reviewed papers, a hundred proceedings papers and hold 8 patents. He is currently the Ultrasonic Diagnostics Group Leader.