Thermal Emmisivity Coeficient of Comercial Selective Coating (Tinox) Measured by Photothermal Radiometry and Photoacustic Spectroscopy Techniques

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In this paper photothermal radiometry (PTR) and photoacoustic (PA) spectroscopy techniques a long with a thermal waves propagation model for a layered system [1], have been used to determinate the thermal emissivity of a commercial selective coating (TiNOX) [2] deposited on aluminum and copper foils. PA measurements were made using a modified conventional Rosencwaig cell in which the sample closes the cell on one side and on the other by a transparent window, through which the coating is illuminated by the modulated laser beam at 808nm and with a spot of 5mm. The temperature variations in the air inside the PA cell were detected using an electret microphone coupled to the cell [3]. The PTR system consists of a modulated laser, at 808nm and with a spot of 5mm that impinges directly on the coating, as a consequence the samples heats periodically and the radiation emitted is collected by a couple of parabolic mirrors and sent into a HgCdTe sensor. Both PA and PTR measurements were performed in the range from 5 to 2000Hz. The PA (PTR) signal was normalized with respect to the PA (PTR) signal of the respective substrate. Given that the substrate is very thick compared with the selective coating layers, using the 1-D model for describing the thermal wave (TW) generation on sample surface and its subsequent propagation, it is shown that the normalized PA and PTR signals do not depend on the thermal properties of the layers, but only on the optical and in the light into heat efficiency. Based on this method, and using both the PA and PTR normalized signals, it is shown that the emissivity of the selective coating can be obtained [4]. It is also shown that this procedure can also provide the thermal emissivity for temperatures above room conditions and up to 60 C. In this case the sample is maintained at constant temperature using a controlled Peltier cell.

References

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