Raman spectroscopic analysis of iron chromium oxide microspheres generated by nanosecond pulsed laser irradiation on stainless steel

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Abstract

Iron chromium oxide microspheres were generated by pulsed laser irradiation on the surface of two commercial samples of stainless steel at room temperature. An Ytterbium pulsed fiber laser was used for this purpose. Raman spectroscopy was used for the characterization of the microspheres, whose size was found to be about 0.2-1.7 μm, as revealed by SEM analysis. The laser irradiation on the surface of the stainless steel modified the composition of the microspheres generated, affecting the concentration of the main elemental components when laser power was increased. Furthermore, the peak ratio of the main bands in the Raman spectra has been associated to the concentration percentage of the main components of the samples, as revealed by Energy-Dispersive X-ray Spectroscopy (EDS) analysis. These experiments showed that it is possible to generate iron chromium oxide microspheres on stainless steel by laser irradiation and that the concentration percentage of their main components is associated with the laser power applied.