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Femtosecond Laser Interaction with Nickel Based Superalloy M-252

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Nickel-base superalloys are an important class of engineering materials designed for high - temperature applications such as aero-engine components. Good corrosion resistance, optimal thermal properties, strength coupled with ductility, creep and fatigue resistance, as well as optimal impact and wear resistance are the main requirements for a satisfactory function in such severe environments at high temperatures.

Lasers have been used for high precision material processing in micro- and nanomanufacturing operations due to the specific nature of the light that they emit, such as the high intensity and the possibility of controlled surface modification. In the last few decades a lot of attention was paid to surface modifications of different metals and their alloys by various types of laser light. Treatment of superalloys' surfaces with laser light can induce the changes in the microstructure which result in improved mechanical properties of the material.

In this work, the process of interaction is related to exposure of nickel superalloy M-252 to femtosecond laser beam. The effect of the laser beams on the surface of the multicomponent alloys is performed by different pulse energies and different exposition time. The changes in the microstructure, depending on the parameters of the laser beam, are identified by the scanning electron microscope (SEM) and energy-dispersive spectrometry (EDS), and the mean grain size was measured by the method of the circle. The aim of the study was to optimize the parameters of laser treatment to reach the microstructure with the favourably affects for the surface quality.