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DIVERSITY OF THE LASER DIRECT MACHINING OF MATERIALS: EXPERIMENTS AND RESULTS

Elena MOCANU[1], Paul E. STERIAN[2]

Rezumat. *Scopul articolului de faţă este să prezinte câteva aspecte noi privind prelucrarea cu laserele a unor materiale. Aplicaţiile micromaşinilor sunt extrem de diverse şi, de aceea, folosesc o paletă largă de lasere în scopul obţinerii, în fiecare caz, a unor rezultate optime şi a unei economii semnificative. Pentru dezvoltarea acestor noi aplicaţii este critic să avem, acces la un portofoliu cuprinzător de produse laser, ca şi la aplicaţiile de dezvoltare suport, pentru a determina cea mai bună soluţie pentru o anumită sarcină. Încercăm să prezentăm câteva aplicaţii industriale ilustrate cu rezultate ale experimentelor efectuate de autori.*

Abstract. *The goal of this study is to present some important updates regarding the laser machining of different materials. Micromachining applications are extremely diverse and therefore utilize a wide range of lasers in order to achieve optimum results and economy in each case. For those developing new applications, it is therefore critical to have access to a comprehensive portfolio of laser products, as well as applications development support, in order to determine the best solution for a particular task. We are trying to expose some industrial applications and the solutions for them, illustrated with results of the authors experiments.*

Keywords: Laser micromachining, thermal diffusion, fiber laser, laser patterning, solar cells, nonlinear absobtion

1. Introduction

A complete understanding of laser interaction with materials is still a matter of trials and adjustments. "A solution looking for a problem" is how many scientists described the first working laser, set up by Theodore Maiman in 1960. The gain medium used by Maiman was ruby (Cr^{3+}:Al_2O_3), which is sapphire (Al_2O_3) with a small number of aluminium ions (Al^{3+}) replaced by chromium ions (Cr^{3+}). De Maria *et al* produced the first ultrashort pulses just six years after Maiman's first laser was demonstrated. In addition to ultrashort pulse duration, ultrashort pulses have a broad spectrum, high peak intensity and can form pulse trains at a high repetition rate. The real physical processes of laser beam interaction (drilling, cutting, or welding) with materials are very complex. Problem of laser interaction with materials presents many difficulties, both from modeling as well as from experimental sides.

[1] Academic Center for Optical Engineering and Photonics, University "Politehnica" of Bucharest, 77206, Romania.
[2] Prof. Dr. Eng., Faculty of Applied Sciences, University "Politehnica" of Bucharest, Romania; full member of the Academy of Romanian Scientists (sterian@physics.pub.ro).