A comparison of surface modification techniques for Ti6Al4V alloy sheets

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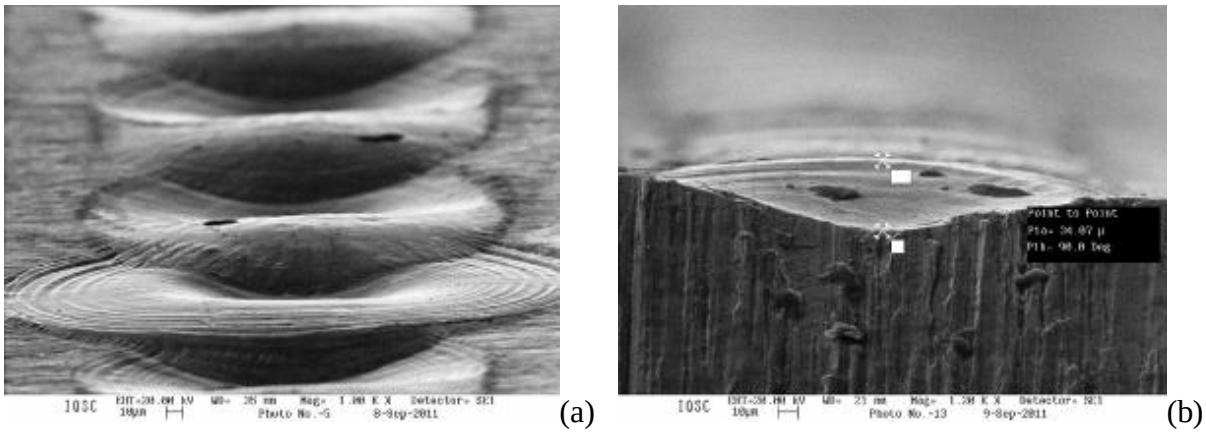
Hybrid fiber-metal laminates (FML) comprise metal-alloy foils interspersed with layers of high performance continuous fiber-reinforced polymer matrix composites [1]. Despite huge developments in the manufacturing process of this attractive structural material especially to aeronautical industry, polymer/metal interface remains a great deal for future advancements and increased mechanical performance. This work focuses in laser-texturing surface metal sheets [2,3] in order to improve metal/polymer interfacial adhesion and, consequently, impart the mechanical resistance of the whole laminate. Therefore, the feasibility of modifying structurally the Ti6Al4V-alloy surface utilizing high-power fibre lasers is verified and characterized. The results indicate the possibility for shaping the metal surface by creating dimples exhibiting well-defined geometry towards higher surface roughness level. A comparison is also made with conventional sandblasted and chemically attacked metal surfaces [4] by completely characterizing the produced topographies through stereoscopy, electronic scanning and atomic force microscopies, as well as profilometry [5].



(a) (b)

Figure 1: (a) Surface texturing pattern in Ti6Al4V-alloy as obtained with 150 W laser-power, (b) Transversal cross-section of a micro-cavity.

Keywords: laser surface texturing, metal/polymer bonding, titanium alloy.

[1] T. Sinmazçelik et al., Mater. & Des. Vol.32(2011) 3671-3685.

[2] C. Spadaro et al., Rad. Phys. & Chem., Vol.76(2007) 1441-1446.

[3] P. Molitor, T Young, . J. Adhes. & Adhes. Vol.24(2004) 127-134.

[4] T. Mertens, et al., Int. J. Adhes. & Adhes. Vol.34(2012) 46-54.

[5] M. Wieland et al., Int. J. Oral & Maxilofac. Implants. Vol.16(2001) 163-181.

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