

Hydration dynamics influence on ultra-short pulsed laser ablation of dental hard tissues

F.G. Rego-Filho¹, G. Nicolodelli², M. Dutra-Corrêa³, M.T. Araujo¹ and V.S. Bagnato²

¹*Universidade Federal de Alagoas, Maceió, AL, Brazil*

²*IFSC – Universidade de São Paulo, São Carlos, SP, Brazil*

³*FOSJC, Universidade Estadual Paulista, São José dos Campos, SP, Brazil*

There has been great interest in laser micro-machining of biomaterials and tissues since the availability of ultra-short pulsed Laser technology. The possibility of tissue ablation with minimal thermal and mechanical damage is attractive in Dentistry for the definite substitution of conventional rotary drills. In this study we aimed to evaluate how the state of hydration of the ablated tissue influences the ablation process itself. Eighty (80) teeth samples, half human and half bovine, have been used in the work. The samples were separated into 4 hydration groups and two types of dental tissue: enamel and dentin. The samples were worn so as to have a plane surface of the target tissue. Five Power levels, ranging from 200 mW to 1W, of a 1 kHz and 70 fs Laser, with three different exposition times, were applied in such surfaces with perpendicular incidence. Scanning Electron Microscopy has also been used to analyze the tissue morphology on the surroundings of the cavities formed. The dependence of the ablated area and affected zones diameters on the hydration state were verified. A strong dependence on the hydration dynamics of thermal damage and ablation threshold was evident.

Keywords: Hydration, ablation, ultra-short pulse, dental tissue.

Work supported by CePOF(Fapesp), Capes and Fapeal.

[1] J. Krüger, W.Kautek, H. Newesely, Appl. Phys. A **69**, 403-407 (1999).

[2] A.V. Rode, E.G. Gamaly, B. Luther-Davies, B.T. Taylor, M. Graessel, J.M. Dawes, A. Chan, R.M. Lowe, P. Hannaford, Australian Dental Journal **48**, 233-239 (2003).

[3] F. H. Loesel, M. H. Niemz, J. F. Bille, T. Juhasz, IEEE Journal of Quantum Electronics **32**, 1717 – 1722 (1996)

e-mail: chico.al@gmail.com