Dental enamel and synthetic hydroxyapatite heated and irradiated by laser of Er,Cr:YSGG : Characterization by FTIR and XRD.

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The study evaluated the physical and chemical changes occurring in enamel and hydroxyapatite (HAP) under the action of heating in oven and under action of Er,Cr:YSGG laser irradiation, which can be used for cavity preparation, cutting bone and prevention of caries. The objective is to correlate the effect of the laser that causes a rapid heating and oven heating that causes a slow warming in the structure of materials trying to identify their composition and making them perhaps more resistant to the process of mineral loss. The HAP was produced by chemical precipitation from solutions of $Ca(NO_3)$ e $(NH_4)_2HPO_4$ under control of the reaction temperature, pH, and the powder enamel were collected of bovine tooth and is therefore calcined in a furnace under temperatures of 200^oC, 600^oC, 800^oC e 1000^oC. For laser irradiation, pellets were made of material and the powder from the samples by laser action were collected. The energies were used of 10,24 ± 0,18 J/cm^2 , 14,40 ± 0,27 J/cm^2 e 18,51 ± 0,35 J/cm^2 and for the enamel and 10,08 ± 0,20 J/cm^2 , 14,12 ± 0,25 J/cm^2 e 18,37 ± 0,37 J/cm^2 for HAP. Their materials were evaluated by the Fourier transform infrared spectroscopy (FTIR), it was observed changed in the bands of carbonate, phosphate and hydroxyl in the structure, which modily the solubility of the material and consequently alter their resistance to caries. The thermal action in the material influences the parameters in its crystallographic unit cell, it were measured changes in the parameters of the lattice unit cell related to changes of carbonates, phosphates and hydroxyl in the structure. Using the X-ray diffraction (XRD) it was detected new crystallographic phases in materials such as the appearance of phases of octacalcium phosphate, beta - tricalcium phosphate and tetracalcium phosphate addition to HAP, some of these phases are chemically more soluble than HAP, which makes the material less resistant to the process of demineralization. By Rietveld refinement of X-ray difratograms, it was obtained also the size of crystallites which increased the extent that increased the temperature and laser radiation. Through the atomic force microscopy (AFM) it was used to assess the size of the crystals of the material heated with range in size from 10 to 30nm. Support by: FAPESP CEPID (05/51689-2), CAPES/Procad (0349/05-4), Rede de Nanofotônica - MCT/CNPq (555170/2005-5).