

Simultaneous Thermal Analysis of high pressure impregnated PMMA for dental applications

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Permanent or temporary dental prosthesis are prepared by milling PolyMethylMetaAcrylat (PMMA) commercial discs to support patients in after mouth surgery. Impregnation of PMMA with anti inflammatory/microbial compounds derived from plant extracts such as clove oil, could improve the healing process of these patients. Impregnation of PMMA is done under different pressures and densities, as well as different times of impregnation using near critical liquid CO₂.

In this study, dental PMMA is impregnated with essential clove oil using as solvent liquid carbon dioxide in which the oil is well soluble. Liquid CO₂ is known to diffuse well inside the PMMA matrix [1], transporting the clove oil inside PMMA as well.

The impregnation of the commercially available clove oil in the PMMA matrix disc was carried out in an high pressure vessel described elsewhere [2], where a known amount of clove oil, CO₂ and PMMA has been placed. CO₂ of 4.9 purity, PMMA disc Telio CAD LT B1 98.5-20 mm of manufacturer Ivoclar Digital and clove oil obtained by steam distillation of producer Argital where used. They were left inside the autoclave for 14 hours, in room temperature and pressure 64 bar. Afterwards CO₂ was released for 1 hour and samples were taken in 2 depths of PMMA disc (5 and 8mm) in order to analyse them for their content of clove oil compounds using simultaneous Thermal Analysis. The analysis is carried out in STA 449 F5 Jupiter of manufacturer Netzsch GB device in which thermogravimetric (TG) and differential scanning calorimetry (DSC) analysis are performed simultaneously.

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