PMMA synthesis for applications in radiologic techniques

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PMMA (poly(methyl methacrylate)) is an inexpensive, biocompatible and biostable thermoplastic polymer with great structural versatility [1]. PMMA was the first acrylic polymer used as a biomaterial, including in pharmaceutical coating processes; due to this, it is well known and studied as a model for developing assets encapsulation and controlled drug release, besides the conjugation with proteins and biomolecules [1,2]. Considering these characteristics, PMMA is a promising polymer to be used in dosimetry studies of ionizing radiation since PMMA polymeric films loaded with luminescent nanomaterials are of high scientific interest besides innovating [3]. This project goal is to synthesize PMMA polymeric films loaded with grains of MgB_4O_7:Ce,Li crystal. Regarding the steps involved, suspension polymerization of methyl methacrylate (MMA), the precursor monomer, was carried out and resulted in the PMMA polymeric microparticles (Figure 1). Suspension polymerization is simple, fast and of high conversion [4]. Besides, this polymerization process allows the addition of MgB_4O_7:Ce,Li that will be present in the final PMMA polymeric film. PMMA microparticles loaded with MgB_4O_7:Ce,Li grains will undergo solvent-evaporation technique to obtain the respective PMMA polymeric film. The solvent-evaporation technique is relatively easy, and it allows the rapid production of small test samples; however, it requires a careful selection of organic solvents to avoid affecting the luminescent properties of the dispersed grains.

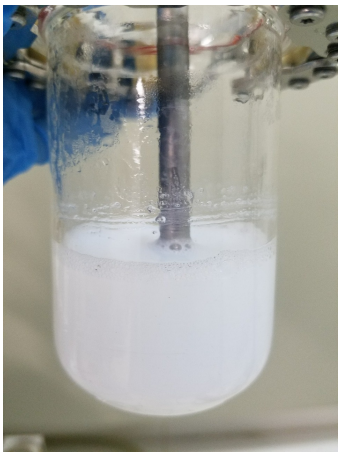

Figure 1. Synthesis of PMMA microparticles

The obtained polymeric films will be characterized by Thermogravimetric analysis (TGA) for determining Tg – transition glass temperature – value; Differential scanning calorimetry (DSC) under nitrogen atmosphere to investigate thermal transitions; Gel permeation chromatography (GPC) for molar masses determination; Fourier transform infrared spectroscopy (FTIR) for the chemical characterization. During this project, polymeric films will be produced with different thicknesses and different percentages and grain sizes of MgB_4O_7:Ce,Li. Natural boron will be used in this crystal synthesis.

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