



EVALUATION OF THERMAL STABILITY OF SILICONE RUBBER FOR BRACHYTHERAPY APPLICATIONS

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Abstract - Brachytherapy is a radiotherapy technique that places the radioactive source close to the tumor, maximizing dose delivery to the target while minimizing radiation to healthy tissues [1]. A promising source for Central Nervous System (CNS) tumors is phosphorus-32 encapsulated in a polymeric substrate, which is malleable and adaptable to the tumor shape. This feature is particularly beneficial in CNS brachytherapy, as it allows the source to be customized [2-3]. Silicone rubber with a platinum-based catalyst is of particular interest due to its biocompatibility and flexibility [4]. In this study, the thermal stability of silicone rubber used as a polymeric matrix for phosphorus-32 sources was evaluated through thermogravimetric analysis (TGA). This study investigated the thermal stability of silicone rubber, with and without H₃PO₄, considering phosphorus-32 in the form of orthophosphoric acid in aqueous solution. Six samples were prepared over three experimental days and analyzed using the SDT Q600 equipment, under a nitrogen atmosphere, with temperature increasing up to 600°C. The results, shown in Fig. 1, demonstrated the thermal stability of the samples at temperatures critical for sterilization processes (up to 120°C), which also includes the boiling point of water. Evaporation near this temperature could compromise the integrity of the source, potentially leading to the leakage of radioactive material.

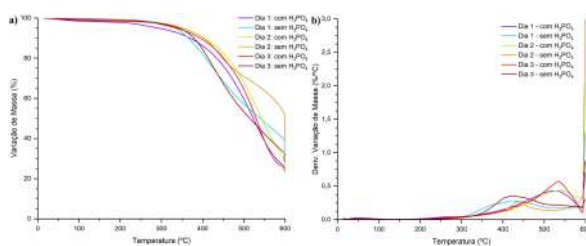


Figure – (a) Mass variation of all samples (with and without the addition of H₃PO₄) as a function of temperature and (b) the respective derivatives of the curves.

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