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# Radioactive Holmium Phosphate Microspheres for Cancer Treatment

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## Abstract

The aim of this study was the development of radioactive holmium phosphate microspheres (HoPO<sub>4</sub>-MS) with a high holmium content and that are stable in human serum for selective internal radiation therapy (SIRT) of liver cancer. To this end, holmium acetylacetonate microspheres (HoAcAc-MS) were prepared ( $34.2 \pm 1.0 \mu\text{m}$  in diameter, holmium content of  $46.2 \pm 0.8$  and density of  $1.7 \text{ g/cm}^3$ ) via an emulsification and solvent evaporation method. The concentration of HoAcAc in the organic solvent, the temperature of emulsification and the stirring speed were varied for the preparation of the HoAcAc-MS to obtain microspheres with different diameters ranging from 11 to 35  $\mu\text{m}$ . Subsequently, the AcAc ligands of the HoAcAc-MS were replaced by phosphate ions by simply incubating neutron irradiated HoAcAc-MS in a phosphate buffer solution (0.116 M, pH 4.2) to yield radioactive HoPO<sub>4</sub>-MS. The obtained microspheres were analyzed using different techniques such as SEM-EDS, ICP-OES and HPLC. The prepared HoPO<sub>4</sub>-MS ( $29.5 \pm 1.2 \mu\text{m}$  in diameter and a density of  $3.1 \text{ g/cm}^3$ ) present an

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