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Use of electrodeposition for the production of Tb-149

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Terbium is an element having four radioactive isotope of interest for nuclear medicine: Tb-149 and Tb-161 for therapy and Tb-152 and Tb-155 for imagery. The production of Tb-161 isotope can be done efficiently with high specific activity in nuclear reactor using Gd-161 target, the isotopes of Tb-149, Tb-152 and Tb-155 can be produced in a commercial cyclotron using a proton beam with energies up to 70 MeV. Both Tb-152 and Tb-155 can be obtained with good yields from a natural gadolinium target. However, the production of Tb-149 is challenging because its production from a natural gadolinium target is very low. To improve its production, it is necessary to use enriched gadolinium either 152 or 154. The enrichment of Gd-152 or Gd-154 is under oxide form and this form can be problematic during irradiation because of its low thermal dissipation. In GIP ARRONAX, in Nantes, we have developed the solid target of gadolinium by the electrodeposition technique. Pure gadolinium coating is impossible in aqueous media due to its high standard potential, -2.279 V/ENH. Working in organic media is an alternative but remain difficult. We decide to use the EMMC technique, Electrodeposited metal matrix/metal particle composites. This technique consists to use the suspension particles of gadolinium salts in aqueous media and during the electrodeposition, these particles are trapped in the Ni deposit. Promising first results will be presented along with data on the characterization of the deposits through MEB-EDS and ICP-OES.

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