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Polonium Evaporation Studies from Liquid Lead-based Alloys

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Liquid lead and liquid lead-based alloys are currently in discussion for application as spallation target material and coolant in neutron sources and Accelerator Driven Systems (ADS). The main disadvantage of lead-based alloys is the formation of Po-210 by nuclear reactions. This radionuclide is an alpha-emitter with a half-life of 138.8 days and therefore of high radiological concern due to inhalation or ingestion in case of its release to the environment. The production of this polonium isotope is especially pronounced in bismuth containing alloys such as lead bismuth eutectic (LBE), which is foreseen as spallation target material and reactor coolant in the ADS prototype MYRRHA. To reduce the hazard resulting from polonium release, pure lead and lead gold eutectic (LGE) are considered as alternative liquid spallation target materials and reactor coolants. Though the production of polonium in these materials is much lower compared to LBE, still considerable amounts are formed. Therefore it is crucial for the licensing of such facilities to study the release behavior of polonium from these materials. In the present study we have investigated the evaporation behavior of Polonium from pure lead and lead-gold eutectic using the transpiration technique. The results are compared with earlier measurements of polonium evaporation from LBE.

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