

Grain size influence on the release of radioactive isotopes out of target materials made of powder

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Radioactive ion beam production by Isotope Separator On Line method (ISOL) has motivated the construction of several nuclear facilities over the world [1]. The method consists in impinging solid target material with beams of stable nucleus. Radioactive nuclei produced during the collision are stopped in the target material and must diffuse out of it as fast as possible to transform them into ions before their radioactive decay. The release time must thus be as short as possible to avoid their losses. The release of the nuclei depends on several parameters, which are related to the chemistry of the atoms in the target matrix, to the geometry and micro-structure of the target, and to its temperature. In the case of targets made of grains, we assumed that an optimum grain size of the grains existed. To make possible an easy determination of the optimum grain size, we did not want to use numerical codes. Thus we have built an analytical description of the propagation of the atoms in the target material, while conserving the different physico-chemical parameters and avoiding the use of adjustable parameters. The description of the propagation process will be presented as well as the assumptions. Finally, the optimum grain size will be given.

References

- [1] See proceeding of the Electro-Magnetic Isotope Separator conference published in Nuclear Instrumentation and Methods in Physics research B.

