

## PROBLEMS OF TRITIUM TARGETS

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### Abstract

Solid state tritium targets are widely used for 14 MeV neutron production of DT-neutron generators. Usually they are produced by evaporation of a Titanium and Zirconium layer on a thin copper backing, with a subsequent absorption of tritium gas in it. The literature of solid state tritium targets during irradiation with ion beam is limited by the heating of the target connected with a higher diffusion rate of Tritium out of the titanium layer, the formation of thin carbon layers at the surface and also ion sputtering processes. It depends also on the composition of ion beam striking the targets (admixture of molecular a.o. components). The use of tritium targets implies the necessity of radiation protection measures due to the radio activity of tritium. The present status of this aspects is discussed in the paper presented including some recommendations concerning the most efficient use of solid state tritium targets.

## TRITIUM SOLID TARGETS FOR INTENSE D-T NEUTRON PRODUCTION AND ITS RELATED PROBLEMS

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### A B S T R A C T

This review paper is divided into three parts.

Firstly, to attain an intense neutron production rate, the construction of a design with a higher tritium-containing surface and an effective cooling system like a rotating target device are discussed. The maximum attainable intensity based on tritium solid targets shall be estimated regarding plannings for future D-T sources.

Secondly, on the way to carry out some experiments, an absolute intensity calibration and an angular dependent neutron energy spectrum of the neutron source are essential parameters to analyse the results of the experiments. Sometimes the space dependent neutron spectrum is required as well as the space dependet neutron

flux near the targets and irradiation samples. The measurement methods and their examples are reviewed for tritium solid targets.

The third part is devoted to discuss the protection to tritium contamination problems due to unavoidable release of tritium gas from targets. Performance and effectiveness of tritium collection systems for intense D-T neutron sources shall be discussed on some examples. Tritium contamination incidents due to the faulted film powder of target surface are also reported in some real incident cases.

**ON THE FAST NEUTRON SPECTRA SHAPE IN  
THE NUCLEAR CONSTANT MEASUREMENT EXPERIMENTS  
WITH AN ELECTROSTATIC ACCELERATOR**

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A B S T R A C T

The approach to calculate the spectra of neutrons being produced in (p,n) reactions on the Van de Graaf accelerators has been considered. The model takes into account the actual layout of the solid tritium target and the irradiated sample as well as the target composition. The main spectrum parameters - the average energy  $E$  and the variants  $D$  - have been calculated for the real experiment.

"Problems Associated with the Production of Monoenergetic Neutrons"

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Neutron producing reactions ( $1 \text{ keV} < E_n < 19 \text{ MeV}$ ) have been investigated with respect to the neutron background production with the time-of-flight method employing pulsed proton or deuteron beams from the Van-de-Graaff accelerator. The largest fraction of