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Test of a ^3He target to be used for transfer reactions in inverse kinematics

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In the last years, in the field of nuclear physics, there has been a large interest in the study of exotic nuclei far from stability. This new quest prompted the development of new research facilities that employ radioactive ion beams (RIBs). One example of these new endeavors is the SPES facility at Laboratori Nazionali di Legnaro in Legnaro (Italy). In order to make the best use of these new beams and to produce the nuclei of interest, new targets of light nuclei (such as d , ^3He , etc.) to be used for transfer reactions in inverse kinematics are of utmost importance. Between these targets, the ^3He ones are some of the most interesting for neutron-deficient nuclei production, but also challenging to produce due to the fact that it is a gas at room temperature and the difficulty in the procurement of the material, which also makes them very expensive. Different techniques have been developed over the years, for example cryogenic targets or gaseous targets contained by thin walls, each with its own advantages and shortcomings.

The purpose of the experiment presented in this contribution was to test an innovative ^3He target produced in collaboration with the CSIC-Materials Science Institute of Seville (Spain), where it was manufactured with a new technique (to be patented) that aims to reduce the costs while providing high quality targets. In particular, solid targets composed of W and ^3He were deposited on a Au backing foil to allow lifetime measurements via Doppler-Shift Attenuation Method. The ^3He target was tested by using the $^{64}\text{Zn}(^3\text{He},n)^{66}\text{Ge}$ reaction. The GALILEO HPGe detector array, coupled to the Neutron-Wall neutron detector array, was used to detect γ rays in coincidence with the emitted neutrons. The EUCLIDES $\text{Si } \Delta E$ - E detector array was used to detect ^3He ejected from the target due to elastic scattering with the beam and to tag fusion evaporation channels with charged particle emission from the fusion of ^{64}Zn with ^3He or the contaminants present in the target. In this contribution, the results of this test experiment will be presented.

Selected session

Nuclear Structure and Dynamics

Primary authors: Dr GADEA RAGA, Andres F. (IFIC CSIC-University of Valencia); Prof. FERNÁNDEZ, Asunción (ICMS, Instituto de Ciencia de Materiles de Sevilla, CSIC-Univ. de Sevilla, Sevilla, Spain); MENGONI, Daniele (PD); Mr HUFSCHEMIDT, Dirk (ICMS, Instituto de Ciencia de Materiales de Sevilla, CSIC-Univ. Sevilla, Sevilla, Spain); Mr CAROZZI, Gabriele (INFN - LNL); VALIENTE DOBON, Jose' Javier (LNL); SICILIANO, Marco (LNL); Dr GODINHO, Vanda (ICMS, Instituto de Ciencia de Materiales de Sevilla, CSIC-Univ. de Sevilla, Sevilla, Spain); Dr MODAMIO HOYBJOR, Victor (LNL)

Presenter: Mr CAROZZI, Gabriele (INFN - LNL)

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