Experiments with ^{44}Ti Beams at ATLAS

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^{44}Ti is an important nucleus for nuclear structure studies as well as for experiments in nuclear astrophysics. It is the first even-even N=Z isotope beyond the closed-shell nucleus ^{40}Ca, where anomalies in elastic and inelastic scattering of alpha particles have been observed. In explosive nucleosynthesis, considerable amounts of ^{44}Ti are produced during the later stages of a supernova in the so-called alpha-rich freeze-out. This fact together with the long halflife of $T_{1/2}$=60y, make ^{44}Ti an ideal tracer to locate individual supernova remnants through their gamma afterglow.

Beams of this isotope with intensities of about 0.1 pnA have recently been produced at the ATLAS accelerator at Argonne National Laboratory using the two-accelerator method. The ^{44}Ti material was produced via the ^{45}Sc(p,2n)^{44}Ti reaction using a 50 MeV proton beam from the linac injector of the Argonne Intense Pulsed Neutron Source. After chemical separation, ^{44}Ti samples were inserted into the negative ion source of the tandem accelerator which is one of the injectors of the superconducting heavy-ion accelerator ATLAS.

With these beams elastic and inelastic scattering of ^{44}Ti on ^{4}He at backward angles and the ^{44}Ti(α,p)^{47}V reaction, which is of importance in supernova explosions, have been studied. Details of the production technique as well as results obtained in these experiments will be discussed.

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