Preparation of a ^{124}Te target for neutron irradiation

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The fabrication of suitable targets for nuclear reaction studies is an important experimental method in the field of Nuclear Chemistry and Physics. In the past, our research group has used the molecular plating [1, 2] technique to fabricate targets of enriched isotopes of Gd for fusion-evaporation reactions with ^{48}Ca, ^{44}Ca, and ^{45}Sc projectiles [3-5]. The molecular plating technique has the advantages of high efficiency and robustness and a wide range of targets can be made with this technique. In addition to the enriched Gd targets, we have made a target of ^{110}Cd [6] which was used in a neutron irradiation to test internal conversion theory [7]. A ^{124}Te has now been fabricated for a similar purpose.

To prepare a target of ^{124}Te, a small (1-2 mg) amount of ^{124}Te metal powder was dissolved in ~200 μL of 2 M HNO_3. The sample was evaporated to dryness under Ar gas, and was then reconstituted with 7 μL of 0.1 M HNO_3 and ~ 12 mL of pure, anhydrous isopropanol. This solution was then added to the electrodeposition cell (see [8] for details on the cell) and the ^{124}Te was deposited onto a 10 μm thick Al backing at 700 V for 1 hour. The resulting target was then baked at 200°C for 30 minutes to convert the tellurium nitrate to tellurium oxide. Example targets using ^{nat}Te were prepared and analyzed using energy-dispersive X-ray spectroscopy (EDS). The EDS technique identifies chemical elements using their characteristic X-ray energies, and an EDS spectrum from a ^{nat}Te target is presented in Fig. 1. EDS is a destructive technique, and the ^{nat}Te targets were fabricated and analyzed so as not to waste the enriched ^{124}Te. The results from the neutron irradiation of the ^{124}Te will be discussed in separate contributions by N. Nica.

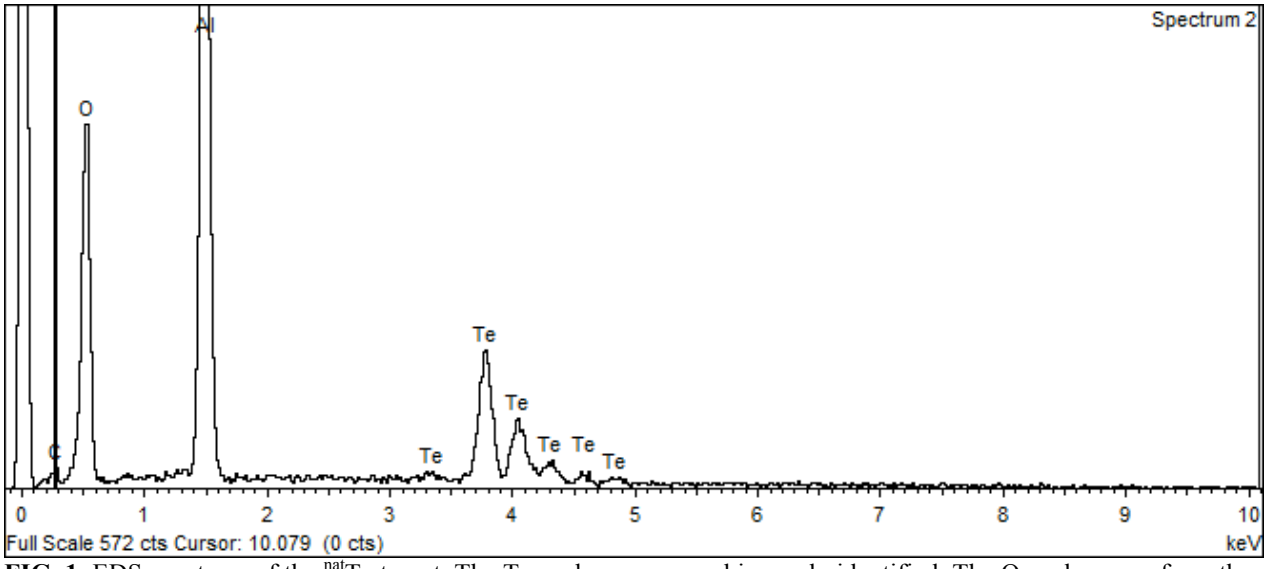

FIG. 1. EDS spectrum of the ^{nat}Te target. The Te peaks were unambiguously identified. The O peak comes from the chemical form of the target (tellurium oxide), the Al peak comes from the Al backing material and the sample holder, and the C peak comes from the carbon tape which was used to adhere the sample to the sample holder. The peak near 0 keV is background.

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