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# Preparation of targets by electro-deposition

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## Introduction

Preparing a good quality target is one of the major aspects of any nuclear physics study. Targets for nuclear reaction and spectroscopic study can be prepared by various methods, viz. e-beam deposition, thermal evaporation, sputtering, rolling, solvent casting method, etc. [1–4]. Most of these techniques are very adequate for preparing thin targets from metallic sample elements (except sputtering, which can be used to prepare targets from oxide material). In some cases, the required study element or isotope is more easily available in oxide forms. Preparing targets from oxide composition requires a different approach. Preparation of thick targets (few hundred microns to mm) can be done by pelletization. For thin targets, sputtering can be used, but for that also, a solid piece of oxide sample is required. Preparation of thin targets from powder samples can be done by the electro-deposition method [5–7]. Here, a simple electro-deposition setup has been presented.

## Target preparation setup

A setup has been designed keeping in mind the simplicity of design fabrication and minimal material requirements for the preparation of targets. FIG. 1 shows a schematic representation of the prepared setup. It consists of a platinum wire ($\sim$ 1 mm diameter) acts as an anode, and its base surface is connected with the ground.

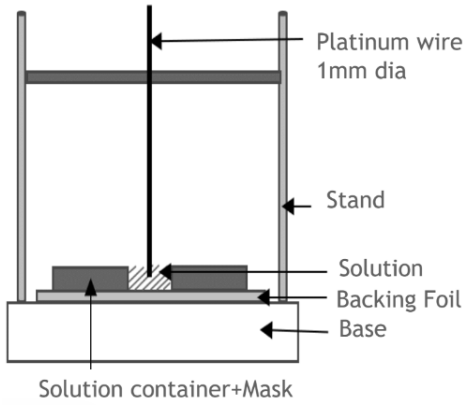


FIG. 1: A schematic view of a typical electro-deposition setup.

A fabricated setup is shown in FIG. 2 with an aluminium backing attached just below the Teflon (white tube). A potential difference between the anode wire and the base is provided by a Canberra power supply module. Any liquid leakage is prevented by placing a rubber gasket between the teflon tube and the backing aluminium foil.

## Solution preparation

For preparation of the target, samarium oxide ($Sm_2O_3$) was chosen. Chemically pure (99.99%) $Sm_2O_3$ was first dissolved in $HNO_3$ and diluted to 1000 ppm with de-ionised water. 1 ml of this solution is then mixed with 30 ml of isopropyl alcohol. 3 ml of this solution is used to prepare each target. Platinum anode wire was imerged $\sim$5 mm inside the solution during electrolysis.

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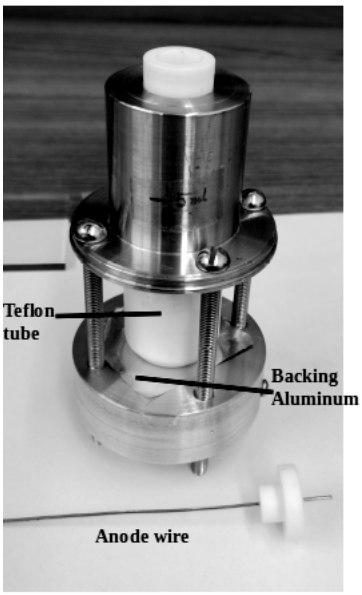


FIG. 2: Fabricated electro-deposition setup

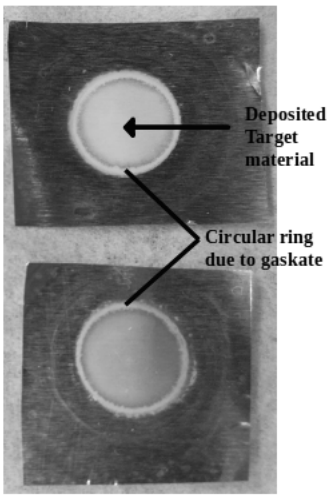


FIG. 3: Initial sample prepared with 40 V potential for 45 mins.

## Target deposition

A small amount (∼3 ml) of prepared solution was poured inside the setup after placing the backing aluminum foil (∼11 $\mu$m). The voltage difference between platinum wire and base was varied (20 - 80 volts) to optimise the target deposition rate. Deposition has been carried out from 20 min to 1 hr for various targets. Two sample targets, preliminary prepared by the above methods, are given in FIG. 3. Target is deposited in a circular area of 1 cm. An outer circular ring in prepared targets (FIG. 3) is due to the gasket used to prevent solution from leaking. Setup is in the preliminary stage and many more targets need to be prepared for testing purposes. Once initial optimization of voltage and deposition time is done, more and more different sample materials with different backings will be tested. Thickness, purity, and uniformity of the prepared target need to be verified after the initial optimization and, accordingly, changes in design and procedure will be implemented to improve the setup.

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