

# Synthesis Of Chromium Thin Film & Its Thickness Measurement using Alpha Source



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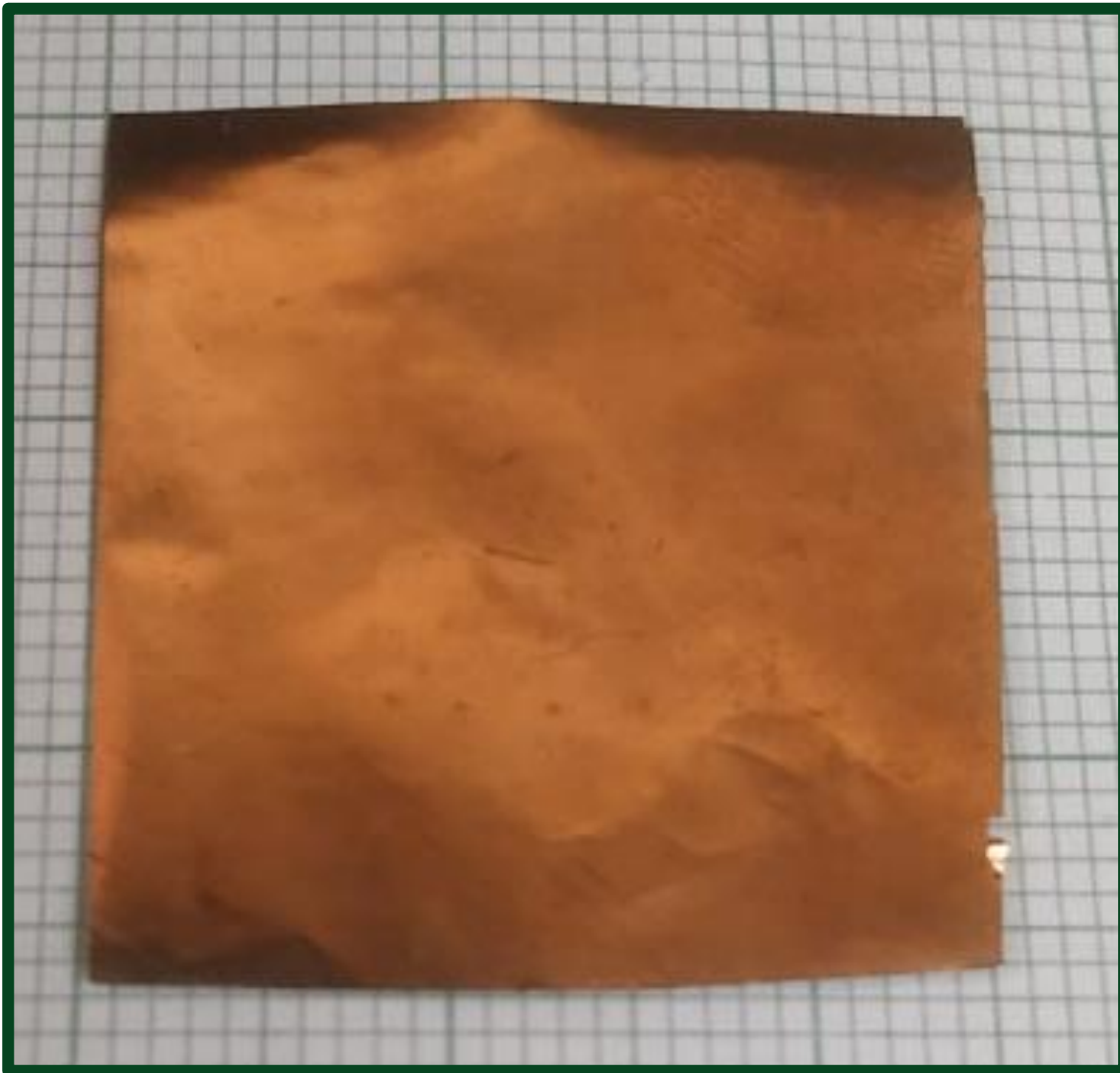
## Introduction

- Self-supporting thin films as targets are required in nuclear and various other research fields.
- Preparation of these films with uniformity and correct thickness is a very crucial part.
- To get the accurate thickness of prepared thin films is utmost important.
- Using an alpha source we can get a very accurate reading of the prepared thin film.

## Process

- For preparation of Chromium thin film we need copper film substrates.
- Copper thin film substrates were prepared using cold rolling setup.
- For preparation of chromium film, substrates were cleaned with nitric acid and then placed inside the chamber at height of 16mm from boat.
- Chromium granules were first crushed to fine powder with handheld ceramic crusher.
- 11 mg of chromium powder was used to achieve thickness of film in between 1-2 mg/cm<sup>2</sup>.

## Setup & Process(Alpha source thickness monitor)



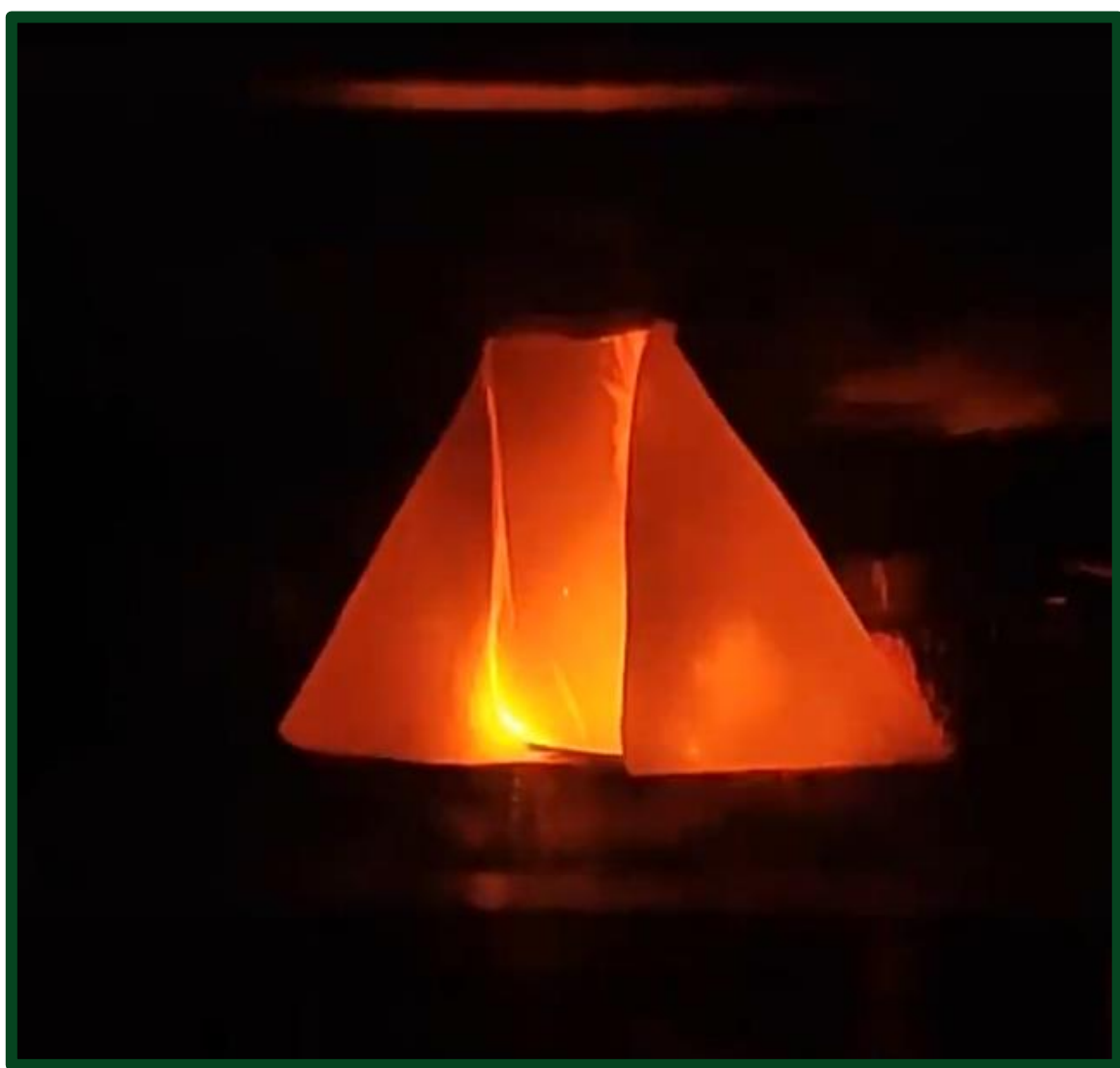
Copper Thin Film Substrate



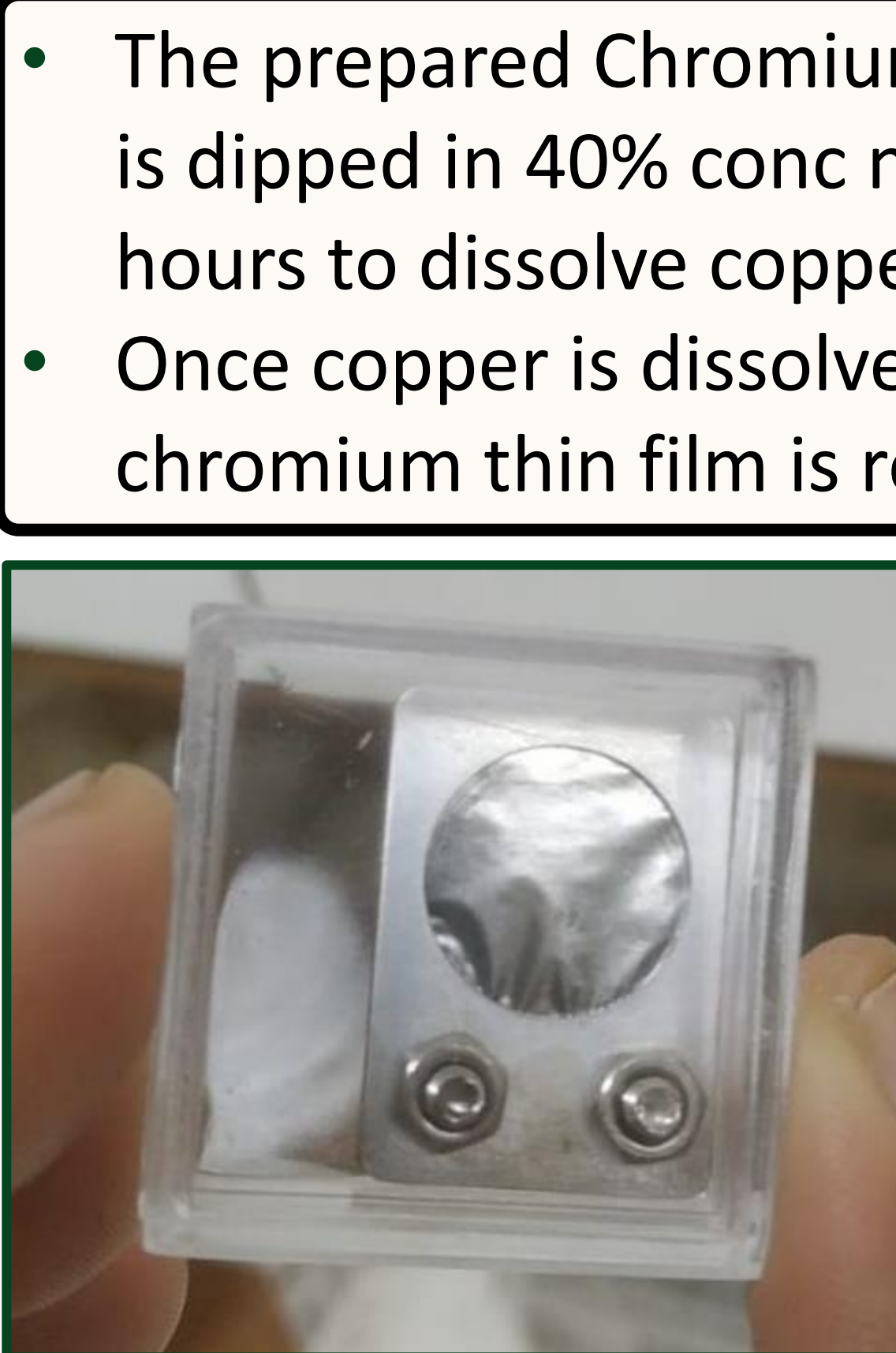
Substrate setup inside chamber



Chromium deposited on Copper film



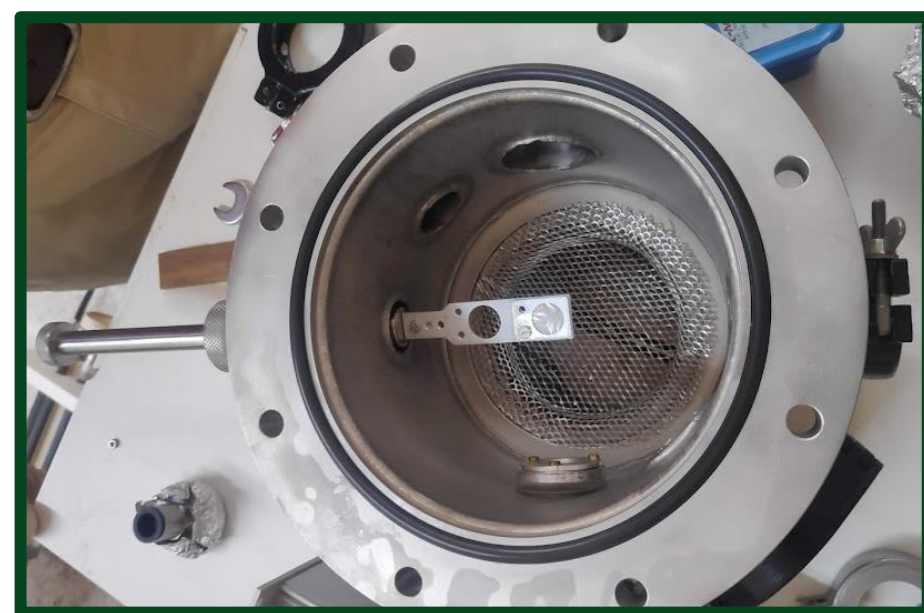
Boat and substrate(16mm)



Self-supporting chromium film

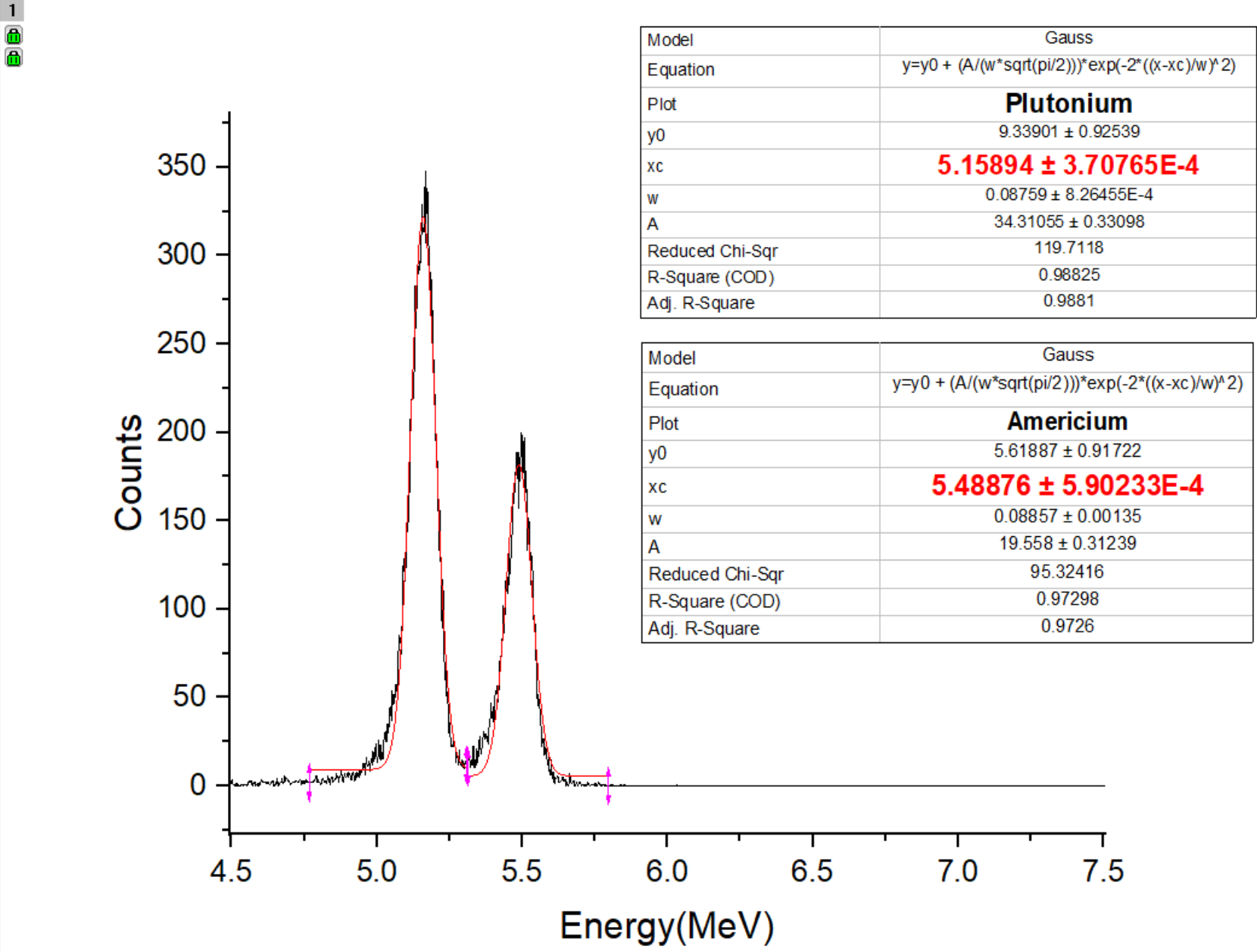
- The prepared Chromium film on copper substrate is dipped in 40% conc nitric acid solution for 6 hours to dissolve copper.
- Once copper is dissolved final self-supporting chromium thin film is ready.

- Film is mounted to the holder and placed in the chamber where it is exposed to alpha particles.
- These particles pass through the film losing energy and are then detected on to detector.
- Source of Alpha – Americium(241) & Plutonium(238).



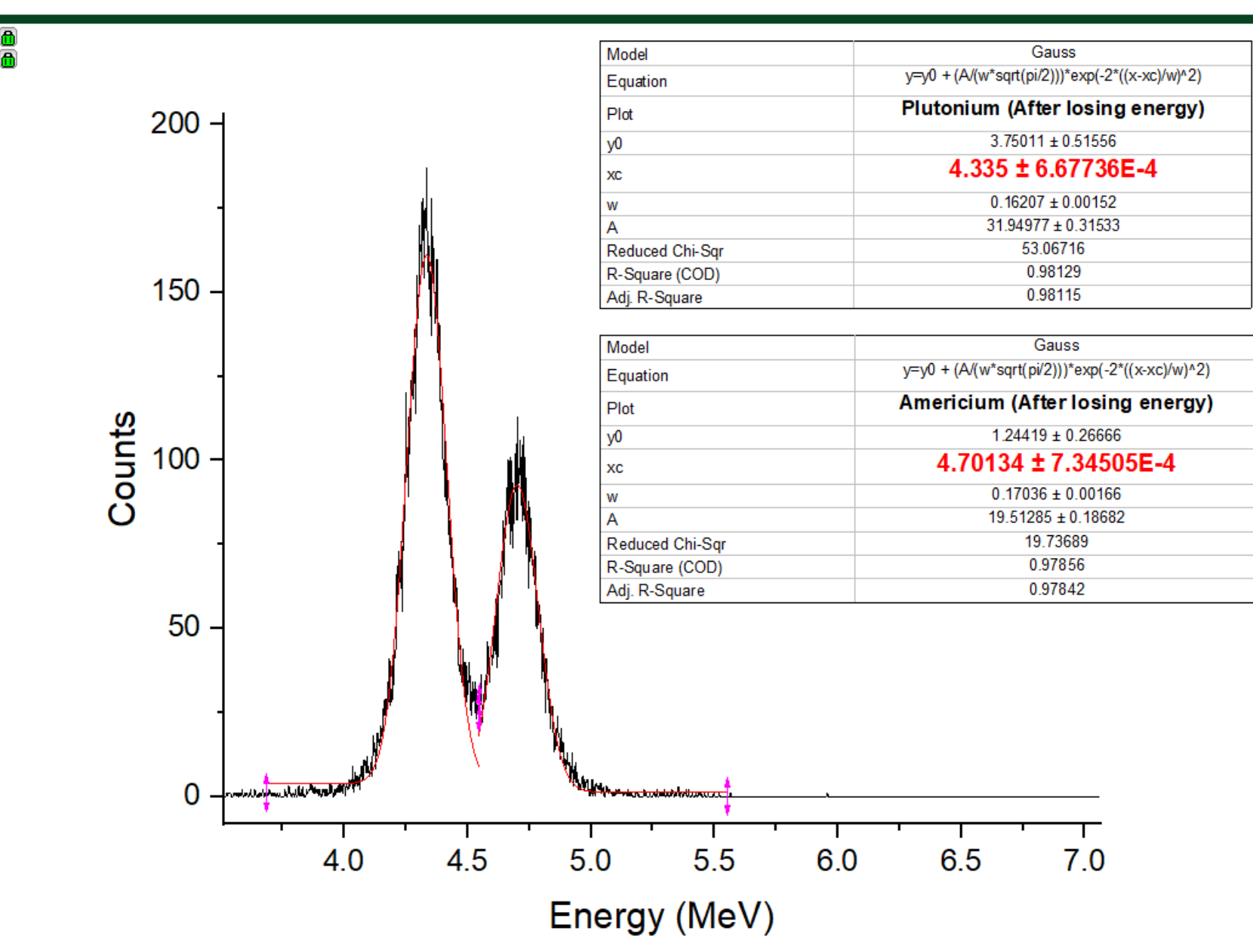
Source

Counts vs Energy of  $\alpha$ -particles before passing through film



- Taller peak is for Plutonium  $\alpha$ -particles with energy 5.158 MeV
- Shorter peak is for Americium  $\alpha$ -particles with Energy 5.48 MeV

Counts vs Energy of  $\alpha$ -particles after passing through film



- $\alpha$ -particles lose energy after passing through film using this loss in energy we calculate the thickness of the film.
- Prepared Film thickness- 1.7 mg/cm<sup>2</sup>.

## Setup (Thin Film Synthesis)

- Setup consists of a chamber, a rotary and a diffusion pump for vacuum.
- There are two copper electrodes through which flowing high current produces heat due to resistance.
- High heat evaporates material

