

# Development of Deuterated Titanium Target on Chemically Etched Copper Substrate

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**M**etal hydride target is one of the important parts of the compact accelerator based neutron generators. Concentration of the deuterium/tritium in the target is also important for the neutron yield. Deuterated titanium target are under development in our laboratory. A comparative study between smooth and rough target were carried out to estimate deuterium concentration. To create roughness, chemical etching was performed.

Two types of copper substrate were used; i.e. mechanically polished and chemically etched. Both the substrates were coated with titanium by thermal evaporation method. Thickness of the titanium film was 2  $\mu\text{m}$ .

The coated substrate was shifted to deuteration chamber and activated for one hour at a temperature of 500°C at a vacuum of the order of  $10^{-7}$  mbar and left for cool down to room temperature. At room temperature the substrate was charged with deuterium. Deuterium charging was carried out for different charging pressure and duration. Higher charging pressure and longer duration is effective for higher deuterium concentration in the film [1].

For comparative study both polished as well as chemically etched samples were charged at 3 bar deuterium pressure and for 120 hours. The deuterium concentration is higher in the case of chemically etched sample. Higher deuterium concentration in chemically etched sample is due to the higher porosity, reduced grain size and different grain boundaries. The D/Ti ratio found out from weight measurement is 1.03 for polished sample whereas in case of chemically etched sample, it is 1.54 [2].

## References:

- [1] B. K. Das et al., Vacuum, 196 (2022) 110724
- [2] B. K. Das et al., Physica Scripta 99 (2024) 065923

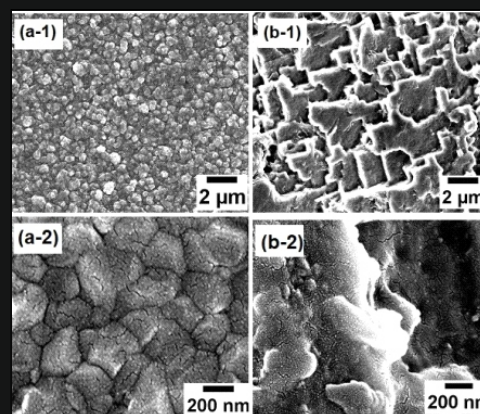


Fig.1: SEM images of Ti film on (a) Polished and (b) Chemically etched copper substrate.

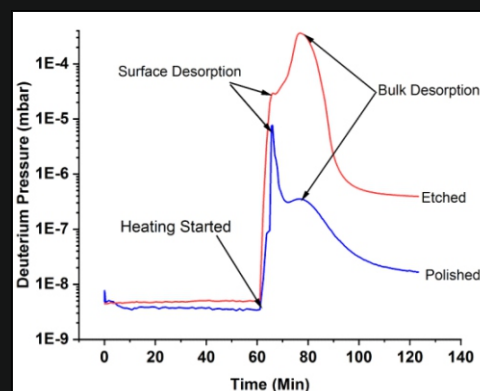


Fig.2: RGA spectra for deuterium emission from polished and chemically etched sample.