



Science and  
Technology  
Facilities Council

# IFAST WP9 Meeting

01/03/23

# V<sub>3</sub>Si deposition

Pulsed DC Magnetron sputtering of a single V<sub>3</sub>Si target.

Deposition length: 3 hours

Pulse length: 1.1 μs

Frequency: 350 kHz

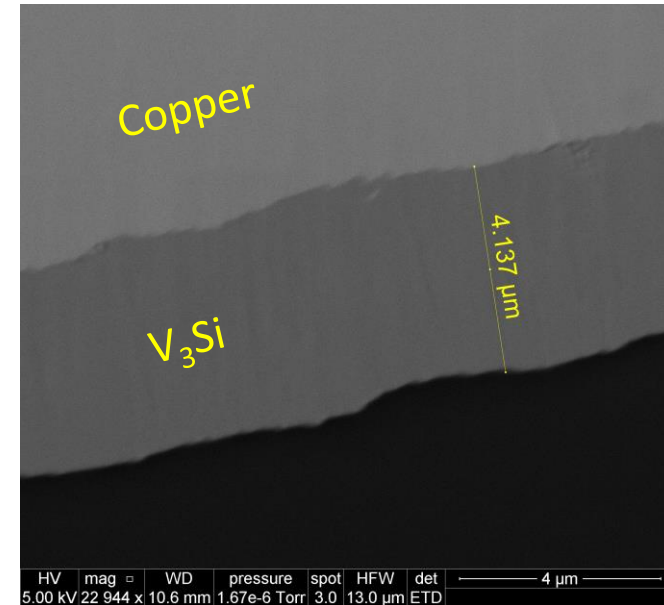
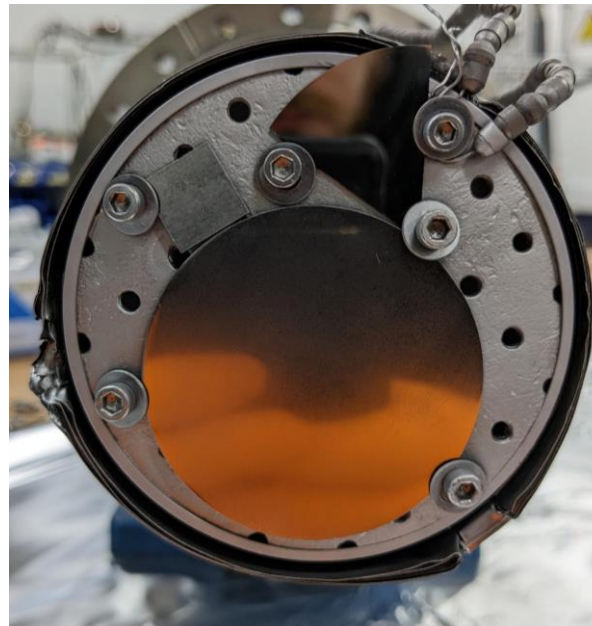
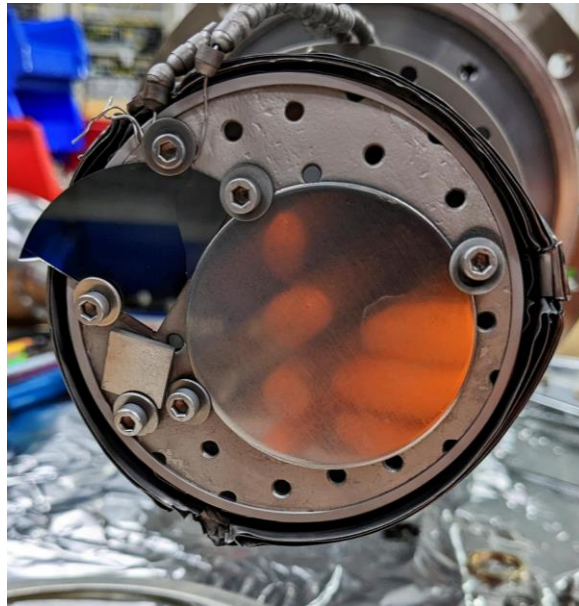
Power: 300 W

Consistent thickness and stoichiometry observed.

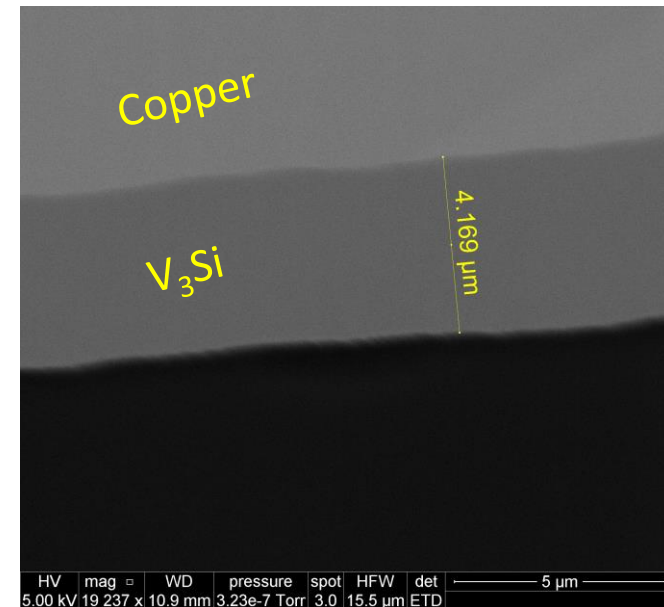
Stoichiometry:

Si ~29 %

V ~ 71 %



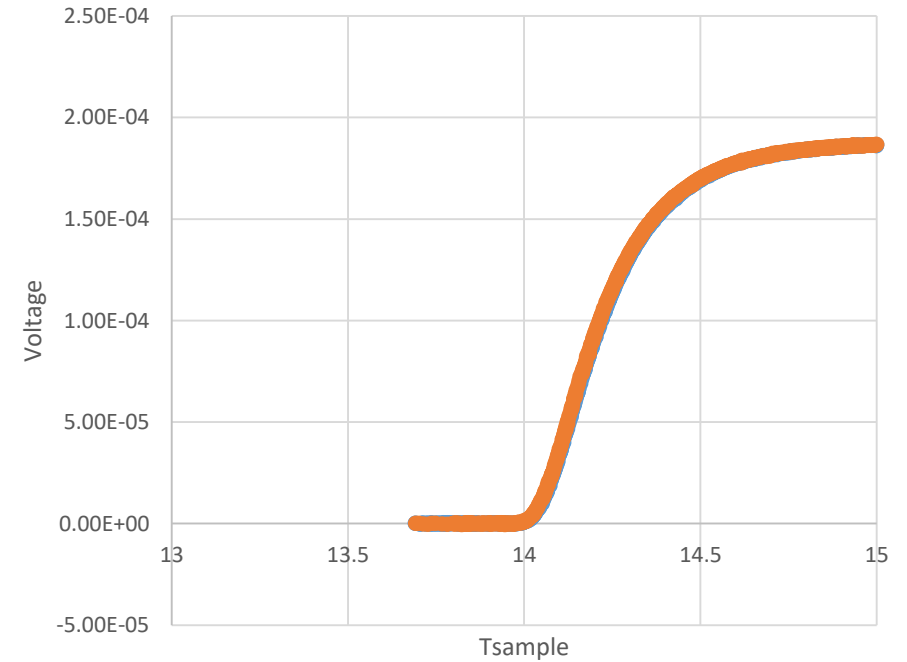
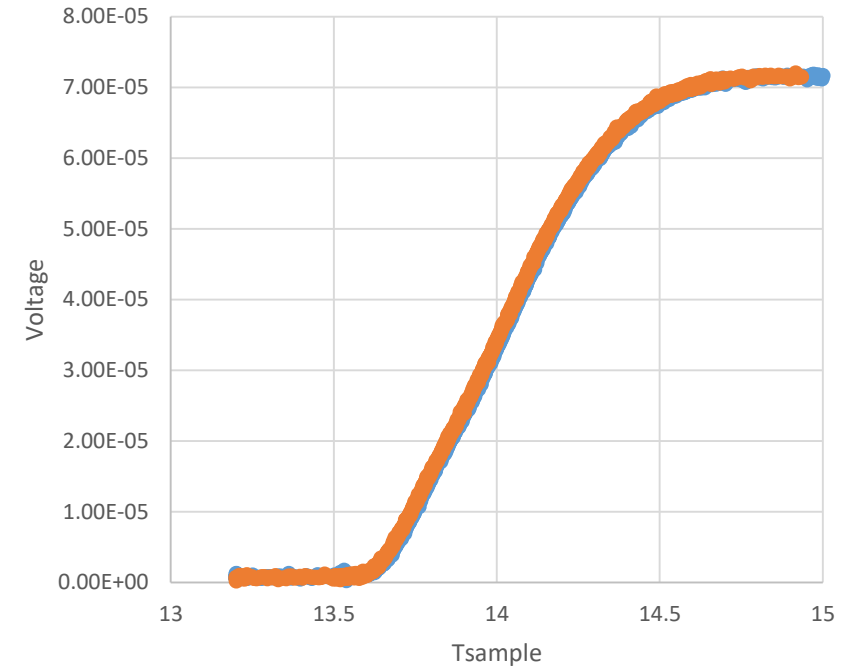
~650°C



~580°C

# $V_3Si$ $T_c$ Measurements

$T_c$  Measurements are showing a 'relatively' sharp transition.

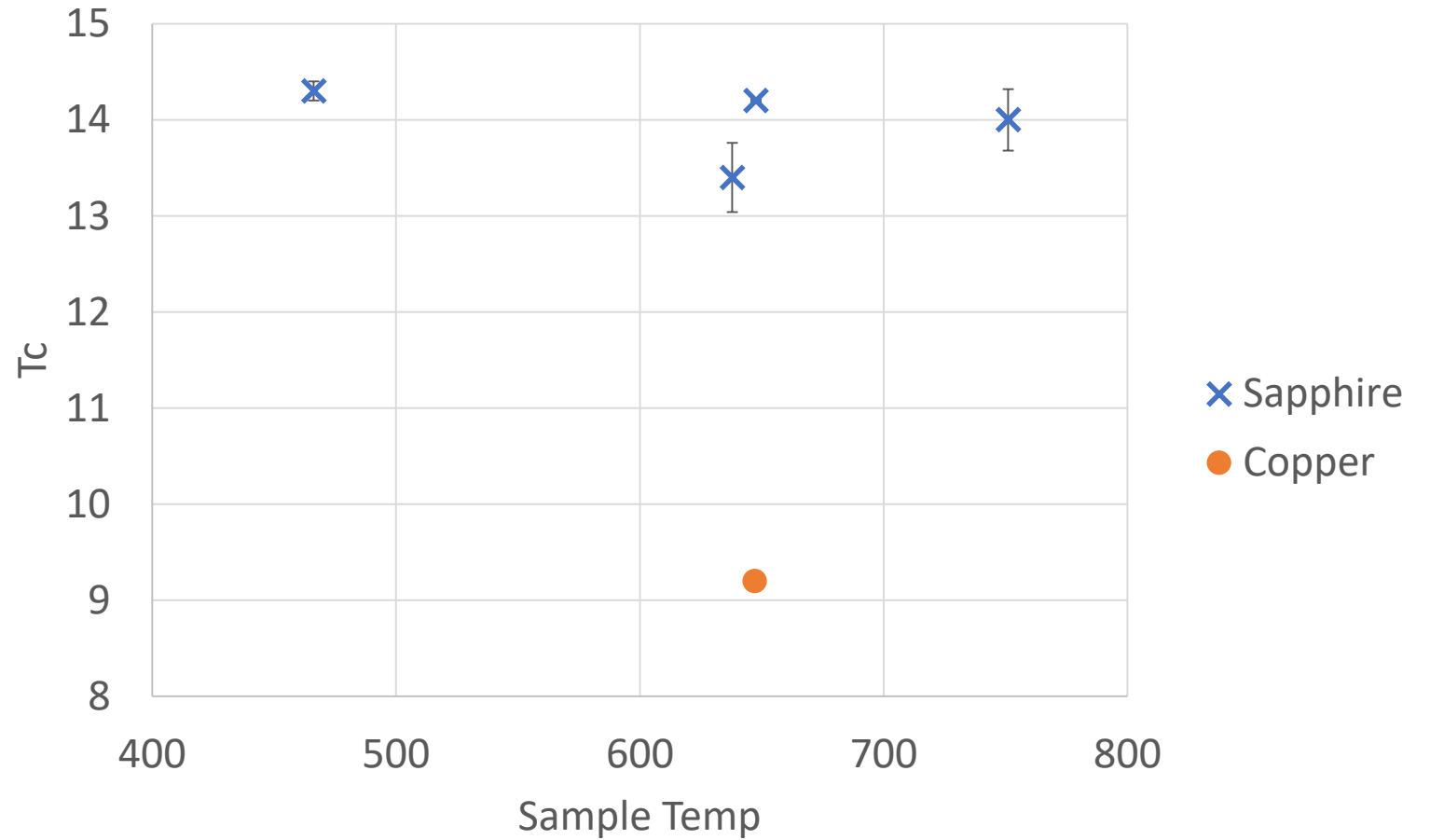


# V<sub>3</sub>Si

T<sub>C</sub> of on Sapphire is relatively consistent with using a single V<sub>3</sub>Si target.

Only one T<sub>C</sub> measurement has been done on copper substrate. 4 K lower.

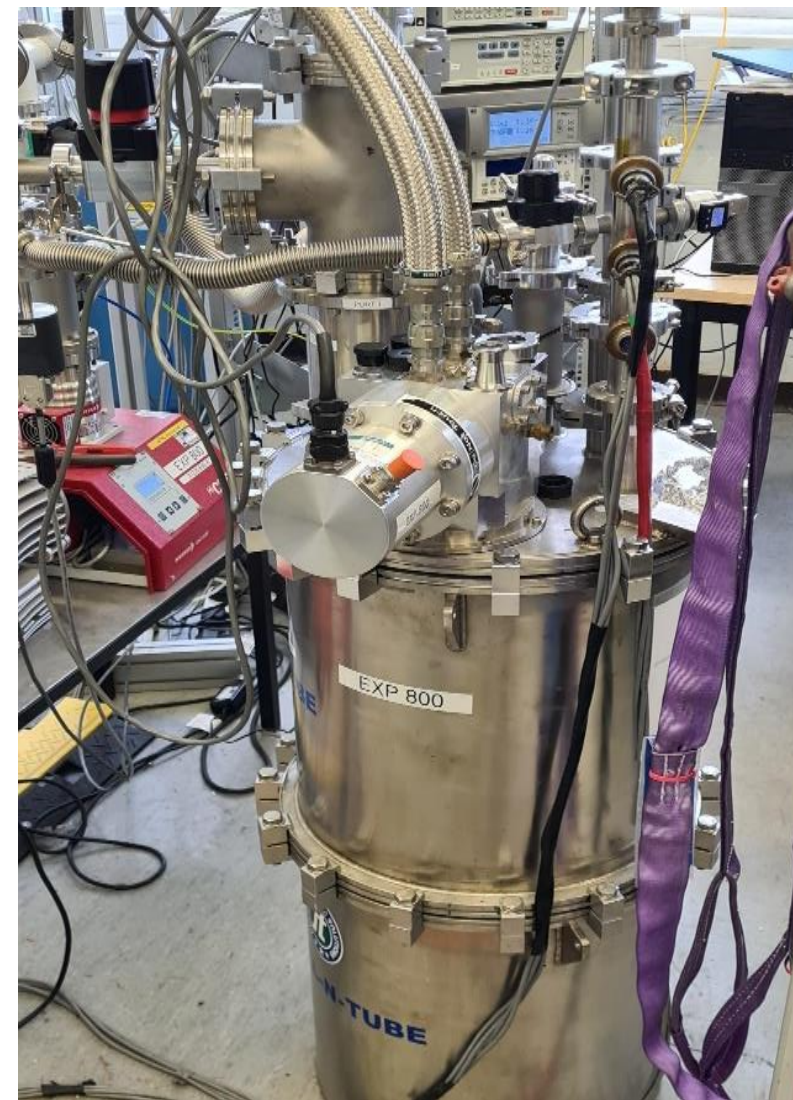
More samples are required.



## V<sub>3</sub>Si Results

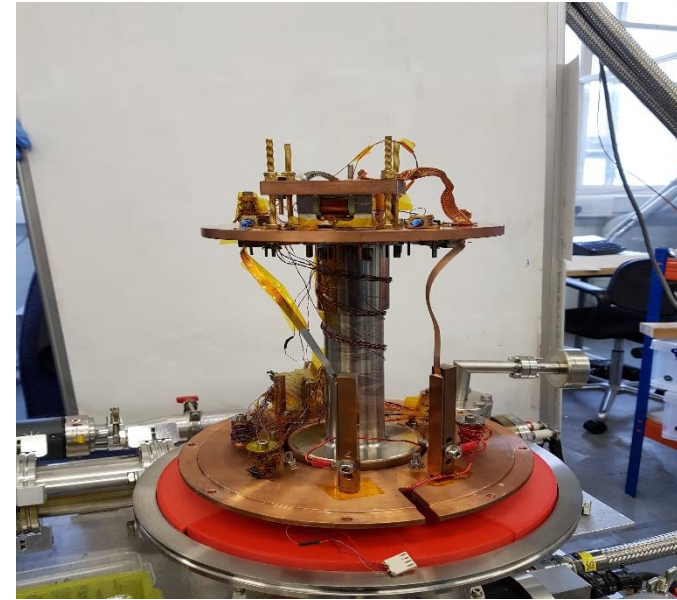
T<sub>c</sub> measurements of V<sub>3</sub>Si are being collated using the multi-probe T<sub>c</sub> measurement insert. T<sub>c</sub>'s are being studied as a function of various deposition temperatures to try and establish the optimum deposition parameters. Satisfying progress is being made and it is hopeful that a much wider catalogue of results should be available to be shared during IFAST 2023 in Trieste.

Sample	Power [W]	Freq. [kHz]	Temp [°C]	T <sub>c</sub> [K]	Comments
V3Si x 1	300	350	790	14.2	1x bulb broke
V3Si x 2	300	350	810	14.8	
V3Si x 3	300	350	880	12.6	2x Bulb broke
V3Si x 4	300	350	567	14.3	
V3Si x 5	300	350	660	11.3	
V3Si x 6	300	350	600	13.5	



# Magnetic Field Penetration Facility Update

A full catalogue of Nb foil samples (1 to 100  $\mu\text{m}$ ) have been tested using the magnetic field penetration facility. Type one and two superconductors have been studied to understand the limitations of the facilities ability to accurately test samples before leakage around the sample becomes a limiting factor. Samples have been tested from 50 mm x 50 mm to 10 mm x 10 mm. More recently, a further set of samples have been investigated using thickness as the main parameter of focus. All results will be presented during the 2<sup>nd</sup> IFAST Annual meeting at Trieste in April 2023.

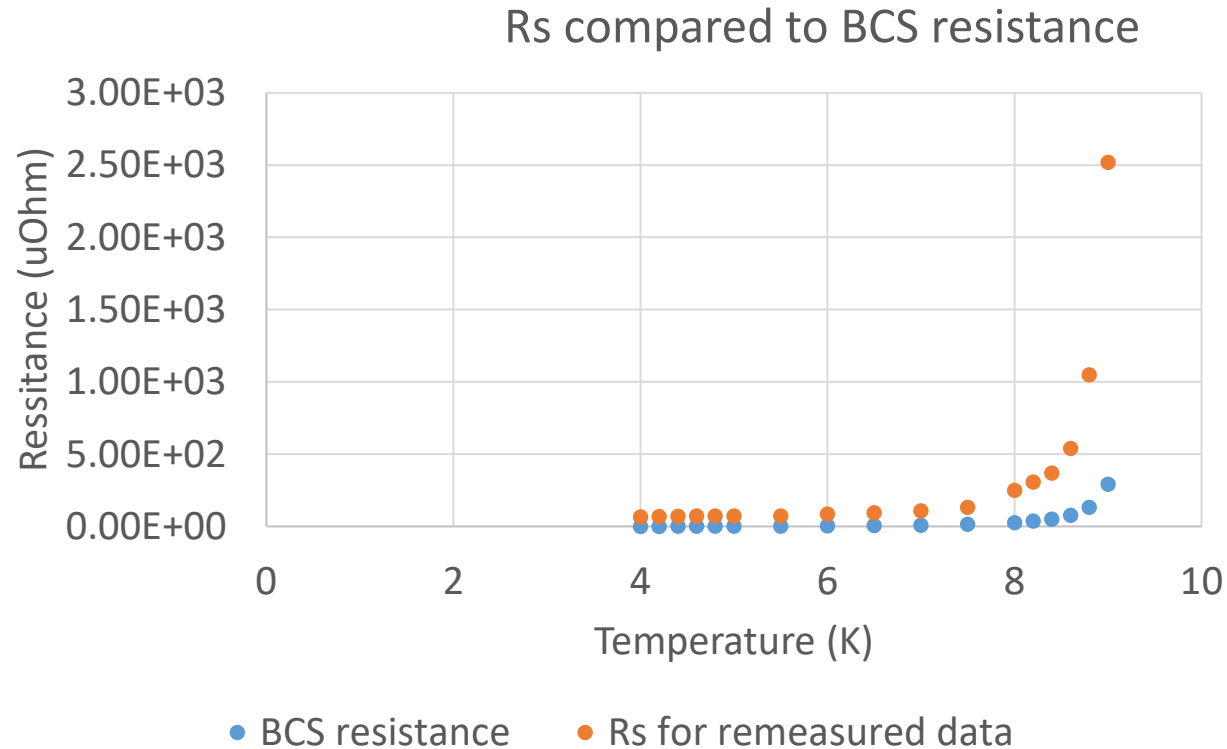


# Latest cavity after Deposition



- Niobium coated
- Deposited with Planar Magnetron
- 4 hr deposition
- Electro polished

# 6GHz cavity measurements



- Surface resistance approx. 70uOhm at 4.2K
- Critical temperature – 9.3K
- Still a factor of 10 above BCS
- To get closer to BCS:
  - Looking for errors in the measurement process
  - Reza improving coatings