MECHANICAL PROPERTIES AND MICROSTRUCTURAL CHARACTERIZATIONS OF DOUBLE FORGED TUNGSTEN

H. Sheng[1,2], I. Uytdenhouwen[1], V.Maussaut[1], G.Van Oost[2] J. Vleugels[3]

[1] *SCK•CEN, The Belgian Nuclear Research Centre, 2400 Mol, Belgium*
[2]*Department of Applied Physics, Ghent University, J.Plateaustraat 22, B-9000 Ghent, Belgium*
[3] *Department of Metallurgy and Materials Engineering, K.U.Leuven, Kasteelpark Arenberg 44, B-3001 Leuven, Belgium*

Corresponding author: hua.sheng@sckcen.be

Materials issues are of vital concern for the development of fusion energy into a sustainable source of energy supply. Advances in plasma physics and thus in fusion device performance have been flanked by an increased understanding of the environment to which materials are exposed in fusion devices and by the development and application of new materials.

None of the W & W alloys developed so-far however has been fully optimized for structure or armour application in fusion reactors. Nor have reference tungsten grades been fully characterized. The double forged pure tungsten was expected to behave homogeneously due to the processing technique. However, we found the mechanical properties to be anisotropic in the longitudinal and transverse directions, as addressed in this paper.

For a better understanding of both recrystallization and ductile to brittle transition temperature, tensile tests are performed on ultra-pure double forged tungsten, produced by Plansee, up to 2000°C at different loading rates (0.2 and 42 mm/min). The mechanical properties are highly dependent on the microstructure. The etched sample surface and fracture surface after tensile testing are microstructurally assessed by Optical Microscopy (OM), Scanning Electron Microscopy (SEM) and Transmission Electron Microscopy (TEM). All the obtained data will be summarized into a database that can be used for future modelling input and will be compared to the same grade material after neutron irradiation.

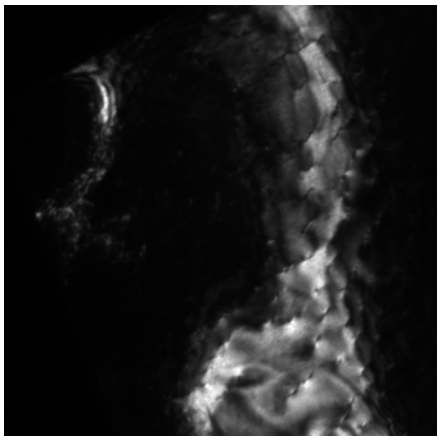

Figure 1:TEM image of double forged tungsten in the longitudinal direction (Dark field image)