TEM Investigation of Two Reference Tungsten Grades for Fusion Applications

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ABSTRACT

Material 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 increasing understanding of the environment to which materials are exposed in fusion devices and by the development and application of new materials. Tungsten and tungsten alloys are being selected for the upper vertical target of the divertor, the baffle and the dome. The lower vertical target would be covered by CFC (carbon fibre composites). However, due to the large tritium retention in co-depositions of graphite materials; it is suggested to replace the divertor for the active phase in ITER to a full tungsten divertor. Also in the European power plant conceptual studies (PPCS), tungsten is being proposed as one of the first wall armour materials for the DEMO design. Therefore, a profound understanding of tungsten is essential due to the increasing demand. This paper focusses on the microstructural investigation of two grades of tungsten, namely potassium doped tungsten (WVWM) and double forged pure tungsten, by transmission electron microscopy (TEM). Since the number and type of defects largely depend on the manufacturing procedure, the temperature treatment and deformation of the material, the microstructural changes caused by double forging, annealing and tensile testing were assessed and interpreted.