TENSILE PROPERTIES AND MICROSTRUCTURE OF A 14Cr-ODS FERRITIC STEEL

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Oxide dispersion strengthened (ODS) ferritic steel, is a promising blanket material for future fusion reactors [1]. A ODS ferritic steel with the chemical composition of Fe-14Cr-1.8W-0.2Si-0.5Ti-0.35Y₂O₃ (in weight percent) was prepared by mechanically alloying (MA) combined with hot isostatic pressing (HIP). The microstructure of both powder and compacted material has been characterised by means of optical and electron microscopy (SEM, TEM). Tensile tests were carried out at room temperature and high temperatures. The effect of HIPing pressure on the tensile test was investigated. The as-HIPed 14Cr-ODS steel exhibite excellent ultimate tensile strength and 0.2% proof stress, but its plasticity at high temperature is not satisfactory. In order to improve the high temperature plasticity, the as-HIPed 14Cr-ODS steel was forged and then heat treated (HT) at 1100°C for 2h in vacuum. Tensile tests show that the 14Cr-ODS steel presented a good plasticity after forging and annealing, while no obvious changes in tensile strength were detected.

[1] J. Henry et al. Journal of Nuclear Materials, 386–388, 2009, 345–348.