

Abstract Submitted
for the DPP13 Meeting of
The American Physical Society

The nano-particle dispersion strengthening of V-4Cr-4Ti alloys for high temperature application in fusion reactors¹ PENGFEI ZHENG, JIMING CHEN, ZENGYU XU, XURU DUAN, Southwestern Institute of Physics — V-4Cr-4Ti was identified as an attractive structural material for Li blanket in fusion reactors. However, both high temperature and irradiation induced degradation are great challenges for this material. It was thought that the nano-particles with high thermal stability can efficiently strengthen the alloy at elevated temperatures, and accommodate the irradiation induced defects at the boundaries. This study is a starting work aiming at improving the creep resistance and reducing the irradiation induced degradation for V-4Cr-4Ti alloy. Currently, we focus on the preparation of some comparative nano-particle dispersion strengthened V-4Cr-4Ti alloys. A mechanical alloying (MA) route is used to fabricate yttrium and carbides added V-4Cr-4Ti alloys. Nano-scale yttria, carbides and other possible particles have a combined dispersion-strengthening effect on the matrices of these MA-fabricated V-4Cr-4Ti alloys. High-temperature annealing is carried out to stabilize the optimized nano-particles. Mechanical properties are tested. Microstructures of the MA-fabricated V-4Cr-4Ti alloys with yttrium and carbide additions are characterized. Based on these results, the thermal stability of different nano-particle agents are classified.

¹ITER related China domestic project 2011GB108007

Pengfei Zheng
Southwestern Institute of Physics

Date submitted: 13 Sep 2013

Electronic form version 1.4