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# Processing and Characterization of Oxide Dispersion Strengthened (ODS) Fe-14Cr-3W-0.5Ti-0.3$Y_2O_3$ (14YWT) Ferritic Steel

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**Abstract :** Oxide dispersion strengthened (ODS) ferritic steels are amongst the most promising candidates for large scale structural materials to be applied in next generation fission and fusion nuclear power reactors. This kind of material is relatively stable at high temperature, possess remarkable mechanical properties and comparatively good resistance from neutron radiation damage. The superior performance of ODS ferritic steels over their conventional properties is attributed to the high number density of nano-sized dispersoids that act as nucleation sites and stable sinks for many small helium bubbles resulting from irradiation, and also as pinning points to dislocation movement and grain growth. ODS ferritic steels are usually produced by powder metallurgical routes involving mechanical alloying (MA) process of Y2O3 and pre-alloyed or elemental metallic powders, and then consolidated by hot isostatic pressing (HIP) or hot extrusion (HE) techniques. In this study, Fe-14Cr-3W-0.5Ti-0.3$Y_2O_3$ (designated as 14YWT) was produced by mechanical alloying process and followed by hot isostatic pressing (HIP) technique. Crystal structure and morphology of this sample were identified and characterized by using X-ray Diffraction (XRD) and field emission scanning electron microscope (FESEM) respectively. The magnetic measurement of this sample at room temperature was carried out by using a vibrating sample magnetometer (VSM). FESEM micrograph revealed a homogeneous microstructure constituted by fine grains of less than 650 nm in size. The ultra-fine dispersoids of size between 5 nm to 19 nm were observed homogeneously distributed within the BCC matrix. The EDS mapping reveals that the dispersoids contain Y-Ti-O nanoclusters and from the magnetization curve plotted by VSM, this sample approaches the behavior of soft ferromagnetic materials. In conclusion, ODS Fe-14Cr-3W-0.5Ti-0.3$Y_2O_3$ (14YWT) ferritic steel was successfully produced by HIP technique in this present study.

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