PRODUCTION AND CHARACTERIZATION OF REDUCED-ACTIVATION FERRITIC-MARTENSITIC STEEL

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One of the main challenges for the realization of the future fusion reactor is the development and qualification of structural materials for first wall and breeding blanket. The fusion reactor application requires materials resistant to radiation damage, high temperature of operation, good corrosion properties and reduced activation potential.

Reduced Activaction Ferritic/Martenistic (RAFM) steels 9Cr are the main candidates for first wall and blanket of fusion reactors, due to their resistance to swelling and excellent thermal properties. These steels are based on the classical Cr-Mo steel but with a chemical composition modified in order to fulfil the low activation requirements, substituting the alloying elements with long decay times due to high activation by neutron irradiation. For this purpose the Mo, the Nb and Ni are avoiding or minimizing the radiological undesirable elements.

This paper shows the work carried out to develop at a pilot plant scale a RAFM steel with chemical composition and metallurgical properties very close to EUROFER steel. The steel was obtained in a Melting Pilot Plant. A High Vacuum Induction Melting Furnace (VIM) was used in order to control and avoid possible impurities and atmospheric pollution. Deformation and Quench Dilatometry has also been used to select the appropriate parameters for the thermomechanical and thermal treatments and the obtained results are also analyzed.

The activity is focussed basically on the evaluation of the microstructural and mechanical properties of a reduced activation ferritic/martensitic steel fabricated at a semi-industrial scale in north of Spain, which chemical composition fulfil or is very close to the compositional specifications and present similar metallurgical properties than the EUROFER steel.

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