

Hot deformation behaviour study of IN-RAFM steel

Abstract

The general processing route for the fabrication of the component involves primary operations like melting, hot working and secondary operations comprising of cold working and process annealing. During the hot working processes, material undergoes various microstructural changes which affect the mechanical properties and the service behaviour of the component. The complex flow behaviour of material occurs during hot deformation where hardening and softening takes place simultaneously and are dependent on the temperature and strain rate. To study the workability of material, the knowledge of flow stress at various temperatures and strain rates as well as strain is very important. Indigenously developed IN-RAFM steel is currently considered as a structural material for the breeding blanket and DEMO fusion reactor design. The mechanical properties of this steel is inherently better than austenitic steel at high temperature. Typically RAFM steels are normalized and tempered which creates tempered martensitic structure. The resulting microstructure produce an optimum combination of strength and toughness at high temperature. As a good material for high temperature applications, IN-RAFM steel has high strength and low plasticity thus only hot forming can be used for fabrication of the components. Thus, understanding of the high temperature deformation behaviour of the IN-RAFM steel is significant to determine optimum process parameters for industrial working processing. In this investigation, hot deformation will be carried out in Gleeble or UTM at temperature 850C-1150C at a strain rate 0.0001-10s-1. Further microstructure evolution during hot deformation will be characterized by using OM, SEM and TEM . The numerical calculation will be performed in order to develop constitutive equation and processing parameter at various strain rate for hot deformation behavior of IN-RAFM steel.

Academic Project Requirements:

- 1) Required No. of student(s) for academic project: 1
- 2) Name of course with branch/discipline: M.E./M.Tech Material Science/Engineering
- 3) Academic Project duration:
 - (a) Total academic project duration: 52 Weeks
 - (b) Student's presence at IPR for academic project work: 3 Full working Days per week

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