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BOOK OF ABSTRACTS

717 Temperature-dependent mechanical stability of retained austenite in thermomechanically processed 3Mn steel

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A new concept of lean medium-Mn TRIP steels containing 3-5 wt% manganese is intensively developed due to growing quality requirements and cost effectiveness of the automotive industry. The lean medium-Mn steels provide excellent combination of tensile strength and total elongation at relatively low alloying cost. Retained austenite is a key microstructural constituent which provides the outstanding strength-ductility balance due its transformation into martensite during deformation. Mechanical stability of retained austenite is an important issue. However, it was studied so far mainly in cold-rolled steels, rarely in thermomechanically processed medium-Mn steels. The stability of γ phase is ralated to several factors including deformation temperture. The heat of plastic deformation generated during technological operations, stamping etc. leads to a considerable temperature increase due to heating affecting the intensity of TRIP effect.
The study is focused on the effect of deformation temperature (20-200°C) on the mechanical stability of retained austenite in 3Mn type thermomechanically processed TRIP steel. The manganese-reduced concept was chosen to avoid the occurrence of PLC phenomenon and to reduce production costs. The investigated steel shows a continuous yielding behavior without formation of Luders bands as a result of the existence of mobile dislocations being the consequence of the previous thermomechanical processing.
A complex analysis of the temperature-dependent microstructural features was performed using scanning electron microscopy (SEM), electron backscatter diffraction (EBSD) and transmision electron microscopy (TEM) methods. The quantitative analysis of the retained austenite amount was conducted using X-ray diffraction (XRD).

718 Detailed structural investigations of nanochains composed of Fe-Ni nanoparticles

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Recently, a relatively new concept i.e. magnetic-field-induced (MFI) synthesis, which allows manufacturing the one-dimensional (1D) wire-like nanochains composed of nanoparticles, has been developed. This method is based on the combination of various chemical processes such as hydrothermal reactions, thermal decomposition processes, reduction reactions, etc. and simultaneous usage of an external magnetic field. In fact, the magnetic field in the MFI synthesis acts as a parameter which allows controlling the nanochains growth in one well-defined direction.
So far, the MFI synthesis has been applied to obtain metallic and alloy-type nanochains. However, the production of bimetallic wire-like structures is much more complicated and it can lead to the formation of non-crystalline materials. Adding that they usually reveal complex core-shell structures in which metallic cores are covered by very thin oxide shells, it is extremely difficult to solve their atomic arrangements and predict the structure-properties

correlations. Hence, this work is focused on the detailed characterization of nanochains composed of $Fe_{1-x}Ni_x$ nanoparticles. Several complementary experimental techniques including scanning electron microscopy (SEM), high resolution transmission electron microscopy (HRTEM), electron diffraction (ED), electron energy loss spectroscopy (EELS), X-ray diffraction (XRD), and X-ray photoelectron spectroscopy (XPS) are used in order to determine the structural features of the $Fe_{1-x}Ni_x$ nanochains with chemical compositions of $Fe_{0.75}Ni_{0.25}$, $Fe_{0.50}Ni_{0.50}$, and $Fe_{0.25}Ni_{0.75}$. Moreover, the formalism of the atomic pair distribution function and computer modeling of the atomic structure are applied to identify and quantified their most likely phases.
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719 Welding solutions for high demanding Cr-Mo(-V) steel grades – Challenges and limits for the development of welding consumables

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Cr-Mo(-V) steel grades are widely used for the fabrication of pressure vessels, tubing and piping systems as well as cast components in petrochemical and thermal power industry. The complexity of novel Cr-Mo(-V) steel grades has significantly grown as a result of ongoing development activities on increasing the efficiency of industrial facilities like hydro processing reactors and thermal power plants. 2¼Cr-1Mo- ¼V steels which are used for the fabrication of hydro-processing reactor vessels in the petro-chemical industry are an excellent example that outlines the challenges for the development of welding consumables fulfilling highest demand on fabrication quality and mechanical-technological properties. Welding parameters and post-weld-heat treatment conditions show a significant effect on toughness and stress rupture performance which needs to be balanced by the weld metal chemistry as well as fabrication technology in line with the code and end user requirements. Novel Cr-Mo(-V) steels like MARBN and Super VM 12 are intended to be used for Advanced Ultra-Supercritical power stations operating at steam temperatures above 630°C. They represent examples of ongoing research and development activities highlighting the difficulties and time scale for the development of suitable and efficient welding solutions. For these novel steel developments impact energy seems to be the crucial challenge for the fabrication of components while long term creep testing is essential in order to evaluate the high temperature service applicability.

720 Stochastic and systematic deviations of creep experiments in martensitic steels

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Extrapolating the lifetime of creep exposed materials is difficult, and a lot of strategies are provided for this task. Since tests can last up to 10+ years, the main challenge is to estimate the long-term behavior of the materials in question out of short-term experiments with the help of materials modeling in order to save time and experimental costs. However, one of the most