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Commentary

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Corrosion of Steels in Hydrogen-Sulfide Media

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Description

Utilizing the inhomogeneity of temperature and stress status during heavy plate rolling, with controlled cooling, polygonal ferrite and quasi-polygonal ferrite with two grain sizes for each were obtained, and their precipitation status varied with different microstructures. GLEEBLE 3500 was used to investigate the influence of microstructure and precipitation status during high temperature tensile deformation. The results revealed that ferrite matrix microstructure and nucleation of precipitates were determined by the overall cooling process, while the final precipitation status was mainly determined by the cooling rate within the temperature range of precipitation during the subsequent isothermal process [1]. Also, dislocations and sub-boundaries acting as containers facilitated the growth of precipitates along some particular directions. Pre-existing substructures, such as low-angle boundaries and statistically-stored dislocations, along with small precipitates, influenced the formation of sub-grains and dislocation cells during high temperature deformation. These newly-generated substructures involved rotation or rearrangement of dislocations, and finally translated into recrystallized grains. Additionally, the grain size was closely related to the probability of interactional of sub-boundaries. Although the polygonal ferrite matrix showed more stable stress status, the quasi-polygonal ferrite matrix with fine precipitates and small grains exhibited better mechanical properties.

Relaxation Properties of Aerex350 and Waspaloy

The relaxation properties of AEREX350 and Waspaloy were studied contrastively at temperatures ranging from the same initial stress. The relationship between the microstructure and relaxation properties was elucidated using scanning and transmission electron microscopy techniques [2]. It was found that the relaxation limit and relaxation stability of the two alloys decreased obviously with the increase of temperature, but the relaxation stability of AEREX350 decreased more slowly compared with Waspaloy. Further investigations show that the relaxation behavior is mainly depended on both precipitate characteristics and its interaction with dislocations. The complex precipitates evolution of AEREX350 alloy leads to a higher relaxation limit at high temperature 800°C, but more quantity at of γ' in Waspaloy results in the higher relaxation limit at the low temperature of 600°C. Thus it is suggested that as fastener alloys, Waspaloy is more suitable for low temperature service while AEREX350 is the preferred choice for high temperature service. The effects of bimodal grain size distributions on the mechanical properties of a newly developed steel were investigated. The microstructures with different levels of bimodal grain size distributions were achieved through rolling at the grain size distribution room where the restoration processes (in particular recrystallization) could be occurred at different rates [3]. The results indicated that the bimodal distribution parameter was increased by raising the rolling temperature and lowering the thickness reduction. In addition, the room temperature strength and ductility were higher for the materials rolled at higher temperatures, where the level of bimodal grain size distributions (bimodality) was greater. This was justified considering the higher possibility of strain induced transformation and twinning in coarser grains than that of finer ones; this in fact would dictate the material work hardening potential during subsequent tensile deformation. For the material rolled at 1000°C, where the grain size distributions were more -lengthy homogeneous and the level of bimodal distributions was low, the austenite to martensite transformation during tensile deformation at room temperature was the prevailing mechanism to induce the plasticity. In contrast, in the materials rolled at 1100 and 1200°C the mechanical twinning came into action thereby a rapid hardening region was recognized in their work hardening behavior. These effects were correlated to the length of work hardening region (dictated by twinning), and the magnitude of hardening rate (controlled by transformation of austenite to α' martensite) [4].

Tensile Properties of Ecaped Samples

Classifying energy materials as passive or active or in relation to conventional, advanced, or future energy systems is useful because it provides a picture of the nature and degree of urgency of the associated materials requirements. But the most illuminating framework for understanding the relation of energy to materials is in the materials properties that are essential for various energy applications. Because of its breadth and variety, such a framework is best shown by examples. In oil refining, for example, reaction vessels must have certain mechanical and thermal properties, but catalysis is the critical process [5]. The tensile properties of ECAPed samples were evaluated at room temperature, and it was proved that ECAP processing can simultaneously improve both ductility and strength of the alloy. It has been indicated that a combination of DRX ratio, and dynamic precipitation during ECAP plays a decisive role in improving the mechanical properties..

The many materials studied and applied in materials science are usually divided into four categories: metals, polymers, semiconductors, and ceramics. The sources, processing, and fabrication of these materials are explained at length in several articles: metallurgy; elastomer (natural and synthetic rubber); plastic; man-made fibre; and industrial glass and ceramics. Atomic and molecular structures are discussed in chemical elements and matter. The applications covered in this article are given broad coverage in energy conversion, transportation, electronics, and medicine.

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