Stability of Retained Austenite in High-Strength Martensitic Steels with Low Ms Temperature

Dagmar Bublíková, Bohuslav Mašek, Ivan Vorel, Štěpán Jeníček
University of West Bohemia, RTI-Regional Technological Institute, Univerzitní 22, CZ – 306 14 Pilsen, Czech Republic, E-mail: dagmar.bublikova@seznam.cz

An important factor in enhancing the mechanical properties of high-strength steels is the stabilization of an appropriate amount of metastable retained austenite in martensitic matrix. Various novel heat treatment and thermomechanical processing routes have been developed recently which benefit from the effects of retained austenite in terms of achieving better elongation at still high ultimate strength levels. One of these procedures is the Q&P process (Quenching and Partitioning). It produces martensite and retained austenite to obtain strengths of more than 2000 MPa and elongation levels of about 10%. For this investigation, four steels with low Ms temperatures have been selected. Their chemistries contained manganese, silicon, molybdenum and chromium. The development of heat treatment sequences involved trials with various austenitizing temperatures, cooling rates, quenching temperatures, and carbon partitioning temperatures for the stage in which austenite becomes stabilized. The experimental heat treatment led to microstructures consisting of martensite with retained austenite in all the steels. Their strengths were in the range of 1750–2400 MPa and their A5mm elongation was 10–15%. The largest fraction of retained austenite, according to X-ray diffraction, was 10%. Specimens with the largest fraction of retained austenite obtained from one schedule were used for studying the stability of retained austenite under cold and hot.

Keywords: Q-P process, retained austenite, AHSS, X-ray diffraction

Acknowledgement

The present contribution has been prepared under project LO1502 ‘Development of the Regional Technological Institute’ under the auspices of the National Sustainability Programme I of the Ministry of Education of the Czech Republic aimed to support research, experimental development and innovation.

References


Paper number: M201777
Copyright © 2017. Published by Manufacturing Technology. All rights reserved.