Effect of Deformation Conditions on Microstructure and Mechanical Properties of Low Alloyed Steel

Ludmila Kučerová[1], Martin Bystrianský[1], Štěpán Jeníček[1], Pavel Francisko[2]
[1]Regional Technological Institute, Faculty of Mechanical Engineering, UWB in Pilsen. Univerzitni 8, 30614 Pilsen, Czech Republic. E-mail: skal@rti.zcu.cz, mbyst@rti.zcu.cz, jeniceks@vctt.zcu.cz
[2]Expert work in manufacturing and economy, Purkyňova 525/356 01 Sokolov, Czech Republic. E-mail: pa.fr@centrum.cz

Low carbon, low alloyed steel 0.2%C-1.8%Si-1.5%Mn-0.06%Nb underwent thermo-mechanical processing routes typical for TRIP (transformation induced plasticity) steels. Deformation conditions were varied, i.e. various numbers of deformation steps of the same size were applied to the steel during the cooling at 50 °C/s to room temperature. This processing enabled comparison of recrystallization ability of the steel at various deformation temperatures. In the next step, two 10% deformations were carried out at the temperatures of 900 °C and 720 °C and the deformation rate was varied from 0.025 s^{-1} to 2.5 s^{-1} to evaluate the effect of deformation rate on the final microstructure and properties of TRIP steel. In this case, tow-step thermo-mechanical treatment was used with additional 600 s hold at a coiling temperature of 425 °C. Final microstructures were analysed by light and scanning electron microscopy and mechanical properties were measured by tensile test of small samples. Ultimate tensile strengths in the region of 800 MPa – 1050 MPa were achieved with accompanying total elongation of 5-37%.

Keywords: TRIP steel, thermo-mechanical treatment, recrystallization

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