Influence of Texture on TRIP behavior of Ultrafine Duplex rich-Mn AHSS

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We summarize our recent findings in the influence of microtexture on the properties of a ultrafine-grained low-C rich-Mn advanced high-strength steels, where our focus is on the effect of austenite texture on the degree of plasticity in duplex austenite-ferrite steels. Our interest in microtexture of duplex steel, specially the austenite phase, stems from the possibility of anisotropy in TRIP behavior of this phase, which will influence the strength and ductility in these types of steels.

The current study aims to unveil the critical factors influencing the discrepancy in TRIP behavior when the specimens subjected to the load in different directions (0° and 90° respect to rolling direction (RD)). The microstructure and microtexture were investigated using scanning electron microscopy-transmission Kikuchi diffraction (SEM-TKD) technique. Orientation distribution function (ODF) method was used to evaluate the microtexture in as-received cold rolled and intercritically annealed specimens at 620 °C for 10 minutes.

It was found that although the final microstructure is equiaxed after annealing but there is a substantial anisotropy in the material properties. As it can be seen in Figure 1, transverse direction (TD) showed around 150 MPa higher yield strength compared with RD ($\sigma_y \cong 1.33\ \mathrm{GPa}$), whereas its ductility was one third of RD. These results showed that texture has a significant effect on the ability of the austenite phase to precisely trigger out TRIP effect and to achieve both ultrahigh strength and excellent ductility.

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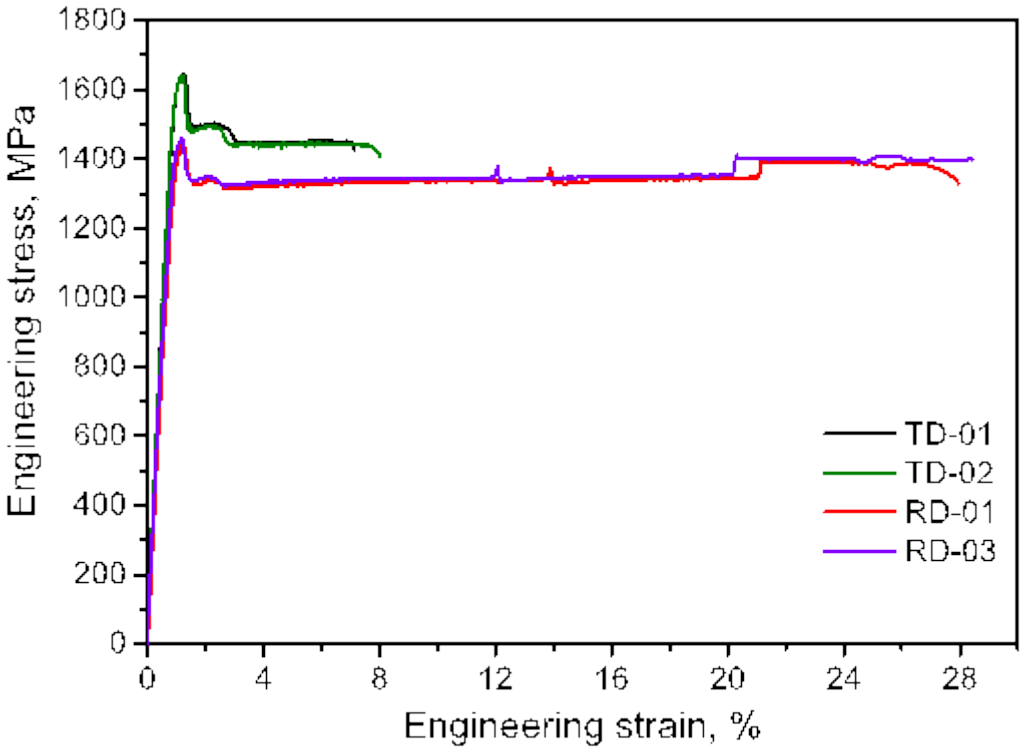

Figure 1. Room temperature engineering stress-strain curves of ultrafine duplex AHSS annealed at 620 ^{o}C for 10 minutes in different loading direction. Tensile experiments were performed at a constant strain rate of 10^{-3} sec^{-1}.