Long-term Sub-zero Treatment of P/M Vanadis 6 Ledeburitic Tool Steel – a Preliminary Study

Peter Jurči[1], Martin Kusý[1], Jana Ptačinová[1], Vladimír Kuracina[1], Petra Priknerová[2]
[1]Faculty of Material Sciences and Technology in Trnava, Paulínská 16, 917 24 Trnava, Slovakia, p.jurci@seznam.cz (corresponding author)
[2]Prikner - tepelné zpracování kovů, Martínkovice 279, 550 01, Czech Republic, Priknerová Petra (p.priknerova@prikner.cz)

The microstructure, the phase constitution and the tempering charts of Cr-V ledeburitic steel Vanadis 6 subjected to sub-zero treatment with various soaking times in liquid nitrogen have been investigated. The microstructures have been characterized using the light microscopy, scanning electron microscopy and X-ray diffraction. The hardness has been evaluated by Vickers method. The matrix is martensitic with certain amount of retained austenite, irrespectively to the time of sub-zero treatment. The amount of retained austenite, however, decreases up to the soaking time of 17 h and then remains almost constant. The microstructure of sub-zero treated steel contains enhanced portion of small globular carbides, as compared to conventionally heat treated material. These particles have a size of around 100 nm in most cases. The as-quenched hardness manifests a moderate increase due to the sub-zero treatment. The hardness decreases during subsequent tempering and this decrease is more pronounced in sub-zero treated samples.

Keywords: Cr-V ledeburitic steel, sub-zero treatment, retained austenite and martensite, carbides, hardness

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