

The Effect of Austenitization Conditioning on the Mechanical Properties of Cr-Mo-V Hot Work Tool Steel with Different Nitrogen Addition

Authors : Iting Chiang, Cheng-Yu Wei, Chin-Teng Kuo, Po-Sheng Hsu, Yo-Lun Yang, Yung-Chang Kang, Chien-Chon Chen, Chih-Yuan Chen

Abstract : In recent years, it is reported that microalloying of nitrogen atoms within traditional Cr-Mo-V hot work tool steels can achieve better high temperature mechanical properties, which thus leads to such metallurgical approach widely utilized in the several commercial advanced hot work tool steels. Although the performance of hot work tool steel can be improved better by alloy composition design strategy, the influence of processing parameters on the mechanical property, especially on the service life of hot work tool steel, is still not fully understood yet. A longer service life of hot work tool steel can decrease the manufacturing cost effectively and thus become a research hot spot. According to several previous studies, it is generally acknowledged the service life of hot work tool steels can be increased effectively as the steels possessing higher hardness and toughness due to the formation and propagation of microcracks within the steel can be inhibited effectively. Therefore, in the present research, the designed experiments are primarily to explore the synergistic effect of nitrogen content and austenitization conditioning on the mechanical properties of hot work tool steels has been conducted and analyzed. No matter the nitrogen content, the results indicated the hardness of hot work tool steels increased as the austenitization treatment executed at higher temperature. On the other hand, an optimum toughness of hot work tool steel can be achieved as the austenitization treatment performed at a suitable temperature range. The possible explanation of such metallurgical phenomenon has been also proposed and analyzed in the present research.

Keywords : hot work tool steel, Cr-Mo-V, toughness, hardness, TEM

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