

고강도강 용접금속의 미세조직에 따른 기계적 특성 변화 연구

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Variation of Mechanical Properties according to Microstructure of High Strength Steel Weld Metal

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Abstract

In the present study, to estimate the mechanical properties of 800 MPa grade weld metal, welding was carried out using 800 and 600 MPa grade flux cored arc welding (FCAW) consumable and characteristics of the weld metals were investigated. The chemical composition of weld metals was investigated by an optical emission spectroscopy (OES) method. The microstructure of weld metals was analyzed by optical microscopy (OM) and secondary electron microscopy (SEM). The compositions and sizes of inclusions which are the dominant factors for the nuclei of acicular ferrite were analyzed by an transmission electron microscopy (TEM). In addition, mechanical properties of the weld metals were evaluated through tensile tests and charpy impact tests. Mostly the acicular ferrite phase which has high strength and toughness was observed. The 600 MPa grade weld metal was consisted of 75% acicular ferrite and 25% ferrite which was formed at high temperature (grain boundary ferrite, widmanstatten ferrite, polygonal ferrite). However, the 800 MPa grade weld metal was composed of about 73% acicular ferrite and 27% low temperature phase (bainite, martensite). Toughness was considerably decreased due to the increase of tensile strength (from 600 MPa to 800 MPa). The sizes of inclusions which were observed in both weld metal were 0.4~0.8 μm , it is effective size to form acicular ferrite.

Key word : high strength weld metal, acicular ferrite, lath size, inclusions