ABSTRACT

The Influence of $MgCl_2$ in the temperature 145^oC to stress corrosion crack the steel AISI 1045

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Stress corrosion cracking of AISI 1045 was examined in the chloride environment at 145 °C for a priods of 10 days. A specimen before bending was carried out by both tension and micro-Vickers hardness tests. In addition, microstructure, fractograph and chemical composition of a specimen after corrosion tests was characterized by Optical microscope (OM), SEM and EDS, respectively.

The tensile strenght of the steel is about σ_u = 461.5 ± 10,03 MPa, σ_y = 320,00 ± 5,99 MPa and the elongation is about e = 33.95 ± 2,31 %. The hardness of the steel before U-bend is about 165,34 ± 2,73 HVN and after U-bend process is about 175,92 ± 1,67 VHN (tension region) and 176,35 ± 1,83 VHN (compression region). The propagation of crack (0,0173 mm/h) in the longitudinal direction was faster than the propagation of crack in the transversal direction (0,00917 mm/h). The branched trangranular crack is most dominantly found in the region of tension residual stress, whereas the intergranular crack is found through of a spesimen thickness region with dimple morphology. EDS results show that both oxygen and chloride were detected on the surface fracture as a corrosion product. However, stress corrosion cracking was dominantly formed by diffusion towards of chloride ions into of grain structure of the steel and caused Fe-atoms segregation.

Key words : AISI 1045, stress corossion cracking, chloride ions, trans/intergran