

# RESEARCH OF X60, X65, AND 3 MAIN GAS PIPELINE STEELS SUSCEPTIBILITY TO STRESS CORROSION CRACKING AND FATIGUE STRESS

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The effect of temperature and hydrogen uptake on X60 and X65 main gas pipeline steels stress corrosion cracking and the effect of various dislocation structures on the development of fatigue failure of 3 steel are shown in this paper.

According to the data from slow strain rate test were plotted two bar charts which present an uplift in the susceptibility of metals to stress corrosion and hydrogen uptake increase as the temperature goes up (from + 25 ° C to + 50 ° C, whereas the susceptibility to stress corrosion upsurged from 0.85 to 0.87 for steel X65 and to 0.9 for steels X60). (Figure 1) The same trend works for hydrogen uptake (from + 25 ° C to + 50 ° C, the hydrogen uptake increased from 1 to 2 mol H/m s for steels X65 and from 1,2 to 3.5 mol H/m s for steels X60). (Figure 2) [1, 2, 3, 4]

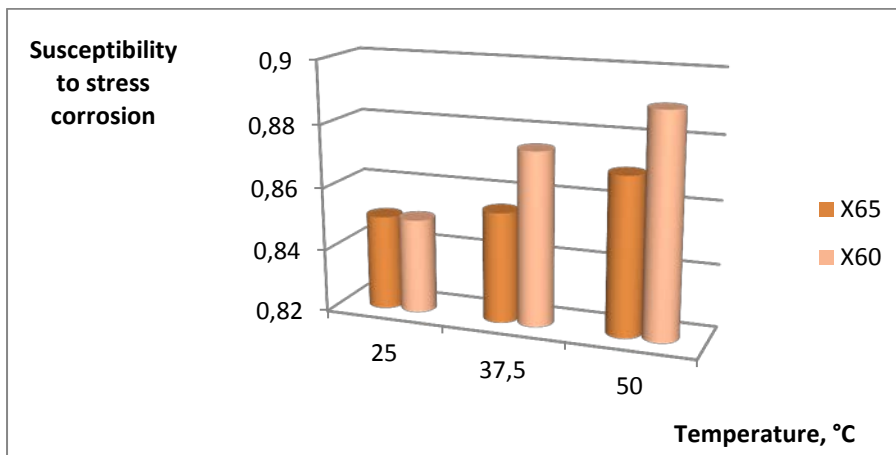


Figure 1 - Dependency graph of the susceptibility to stress corrosion from temperature

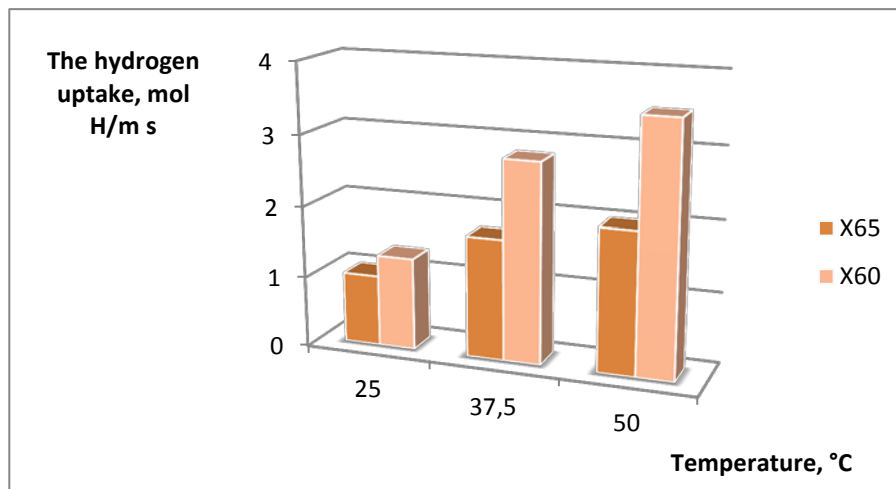


Figure 2 - Dependence diagram of the hydrogen uptake from temperature

In second research vee-configuration 3 steel samples were tested for fatigue stress under low-cycle deformation condition and continuous stress. The results show that steel with grain

boundaries had 1.3  $\mu\text{m}$  fatigue punch width, whereas steels with initial and cellular structure had 0.34 and 0.42  $\mu\text{m}$  respectively. (Figure 3) [5-10]

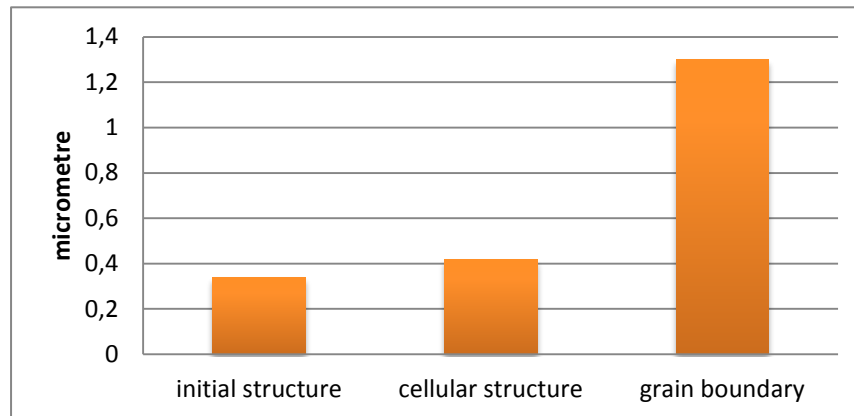


Figure 3 - Fatigue punches width

In the result of first investigation was experimentally shown the influence of dislocation structures inside the ferrite grains of 3 steel on the development of fracture processes. As a result of another experiment it was found a clear dependence of the occurrence of stress-corrosion on the X60 and X65 gas main pipeline steels on temperature and hydrogen uptake. The results of the comparison of the susceptibility of steel grades to stress corrosion under the influence of different temperatures show an increase in the susceptibility of metals to stress corrosion as the temperature rises and the same tendency works for hydrogen uptake.

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