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## 研究报告

### 微观组织对X52钢抗H<sub>2</sub>S腐蚀和开裂性能的影响

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**摘要:** 通过对X52钢进行热处理获得三种不同组织。SEM观察发现三种组织分别为铁素体/带状珠光体、马氏体/贝氏体和针状铁素体/回火马氏体。通过动电位极化、线性极化电阻、氢致开裂(HIC)实验和硫化物应力腐蚀开裂(SSC)实验,研究了不同热处理对X52钢在H<sub>2</sub>S环境中的腐蚀与开裂行为的影响。结果表明马氏体/贝氏体显微组织由于位错密度很高且脆性大,因而腐蚀速率及HIC和SSC敏感性很高。铁素体/带状珠光体组织和针状铁素体/回火马氏体组织腐蚀速率及HIC和SSC敏感性很低。针状铁素体/回火马氏体组织由于不含带状组织且晶粒细小以及碳化物的析出,因此其HIC和SSC抗性优于铁素体/带状珠光体组织。

**关键词:** 低合金钢 微观组织 硫化氢 氢致开裂 硫化物应力腐蚀开裂

### MICROSTRUCTURE EFFECTS ON CORROSION AND CRACKING BEHAVIOR OF X52 PIPELINE STEEL IN H<sub>2</sub>S ENVIRONMENT

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**Abstract:** Three different microstructures of X52 pipeline steel were obtained through different heat treatments. SEM results showed that the three different microstructures were ferrite/band pearlite, martensite/bainite and acicular ferrite/tempered martensite. The effects of microstructures on corrosion and cracking behavior of X52 steel in the H<sub>2</sub>S-containing solution were studied through potentiodynamic polarization measurements, linear polarization resistance measurements, hydrogen induced cracking (HIC) tests and sulfide stress cracking (SSC) tests. The results showed that martensite/bainite had the highest corrosion rate as well as highest susceptibility to suffer HIC and SSC of all the three microstructures due to its high density tangled dislocation and its high brittleness. Both of ferrite/band pearlite and acicular ferrite/tempered martensite had lower corrosion rate and better HIC and SSC resistance compared to martensite/bainite. However, the acicular ferrite/tempered martensite microstructure had higher resistance of HIC and SSC than ferrite/band pearlite due to the elimination of band structures, grain refinement and the precipitation of fine carbides in the matrix.

**Keywords:** low alloyed steel microstructures H<sub>2</sub>S HIC SSC

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