

### 论文摘要

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## 高温高压H<sub>2</sub>S/CO<sub>2</sub> G3镍基合金表面的XPS分析

陈长风<sup>1</sup>, 范成武<sup>2</sup>, 郑树启<sup>1</sup>, 张国安<sup>1</sup>, 戈磊<sup>1</sup>, 陈立强<sup>1</sup>

(1. 中国石油大学 材料科学与工程系, 北京 102249;  
2. 中石化集团公司工程部, 北京 100029)

**摘要:** 采用XPS研究镍基合金UNS N06985(即G3)在高压H<sub>2</sub>S/CO<sub>2</sub>环境腐蚀前后钝化膜的结构与组成。研究两种环境条件对G3钝化膜的影响, 第一种环境为H<sub>2</sub>S分压3 MPa、CO<sub>2</sub>分压2 MPa、实验温度为130 °C; 第二种环境为H<sub>2</sub>S分压3.5 MPa、CO<sub>2</sub>分压3.5 MPa、实验温度为205 °C。测试结果表明: 腐蚀前和第一种环境条件下获得的钝化膜具有双层结构, 钝化膜表层主要为氢氧化物, 内层主要是Cr<sub>2</sub>O<sub>3</sub>和组成合金的各种金属组成; 在第二种环境条件下获得的钝化膜可分为3层, 外层主要是硫化物, 过渡层含有较多的氢氧化物和金属硫化物, 内层主要是氧化物和金属单质。随着环境条件的苛刻, 镍基合金钝化膜的保护作用降低, 腐蚀破坏程度加重。

**关键字:** 镍基合金; 高H<sub>2</sub>S分压; 钝化膜; XPS分析

## XPS analysis of surface of G3 nickel base alloy under high H<sub>2</sub>S and CO<sub>2</sub> partial pressure

CHEN Chang-feng<sup>1</sup>, FAN Cheng-wu<sup>2</sup>, ZHENG Shu-qi<sup>1</sup>, ZHANG Guo-an<sup>1</sup>, GE Lei<sup>1</sup>, CHEN Li-qiang<sup>1</sup>

(1. Department of Materials Science and Engineering, China University of Petroleum, Beijing 102249, China;  
2. Department of Engineering, SINOPEC, Beijing 100029, China)

**Abstract:** The compositions and structures of the passive films formed on G3 nickel base alloy under high H<sub>2</sub>S and CO<sub>2</sub> partial pressure were investigated by X-ray photoelectron spectroscopy(XPS) as a function of depth. The effects of two type of corrosion environments on the passive films of G3 nickel based alloy were studied. One is the environment with the H<sub>2</sub>S partial pressure of 3 MPa, CO<sub>2</sub> partial pressure of 2 MPa and the exposure temperature of 130 °C. The other is the environment with the H<sub>2</sub>S partial pressure of 3.5 MPa, CO<sub>2</sub> partial pressure of 3.5 MPa and the exposure temperature of 205 °C. The results show that the passive films formed on G3 nickel base alloy in environment 1 possess two layer structure similar with the alloy before exposure. The outer layer is hydroxide, the inner layer is Cr<sub>2</sub>O<sub>3</sub> and metals. The passive films obtained in environment 2 display the structure of three layers. The outer layer composes of metal sulfides, the transition layer

is the hydroxide of Cr and Ni and the inner layer is the oxides of Ni and Cr and metals. The semiconducting properties of passive films correlate with its structures.

**Key words:** G3 nickel base alloy; high H<sub>2</sub>S partial pressure; passive film; XPS analysis

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地 址：湖南省长沙市岳麓山中南大学内 邮编： 410083

电 话： 0731-8876765, 8877197, 8830410 传真： 0731-8877197

电子邮箱： [f-ysxb@mail.csu.edu.cn](mailto:f-ysxb@mail.csu.edu.cn)