中国腐蚀与防护学报 >>2011 >>31 >>(6)

中国腐蚀与防护学报 2011, **31**(6) 483-487 **DOI**: **ISSN**: 1005-4537 **CN**: 31-1421/TG

研究报告

304L不锈钢在两种高温高压水溶液中形成的钝化膜半导体性质研究

张胜寒,连佳,檀玉

华北电力大学环境科学与工程学院 保定 071003

摘要： 304L不锈钢在$ZnSO_4$和Na_2SO_4两种高温高压水溶液中腐蚀后表面形成一层钝化膜，对腐蚀后样品在硼酸缓冲溶液（pH8.4）中进行动电位扫描，并绘制其Mott-Schottky（M-S）曲线；利用光电流法，绘制（$I_{ph}h\nu/I_0$）$^{1/2}$-光子能量曲线，详细分析表面钝化膜半导体性质。结果表明：含锌样品表面钝化膜呈现多层结构；钝化膜的半导体类型为n型（不含锌样品钝化膜呈p型）；平带电位负移；载流子浓度降低；Zn^{2+}对304L不锈钢钝化膜半导体的结构及性质有较大的影响。

关键词： 锌离子 高温水 不锈钢 钝化膜 半导体性质

SEMICONDUCTOR CHARACTER OF PASSIVE FILMS FORMED ON 304L STAINLESS STEEL IN ZINC CONTAINED HIGH TEMPERATURE WATER

ZHANG Shenghan, LIAN Jia, TAN Yu

Environment Science and Engineering School,North China Electric Power University, Baoding 071003

Abstract: Semiconductor properties of the passive film formed on 304L stainless steel (SS) in high-temperature and high-pressure water with (or no) zinc addition were investigated using anodic polarization curves, Mott-Schottky plots and photocurrent method in buffer solution. And the donor density, flat band and band gap were analyzed to investigate the effect of zinc addition on the passive film particularly. The results indicated that the passive film formed on 304L with zinc addition was composed of many layers; the passive film with zinc addition behaved as a n-type semiconductor, a p-type with no zinc addition; the flat band shifted negatively; the carrier concentration reduced; It was concluded that zinc addition had great influence in the structures and semiconductor properties of 304L stainless steel (SS).

Keywords: zinc addition high temperature water stainless steel passive film semiconductor character

收稿日期 2010-11-29 **修回日期** 2011-10-18 **网络版发布日期** 2011-12-14

DOI:

基金项目:

国家自然科学基金项目(50971059)资助

通讯作者: 连佳

作者简介: 张胜寒，男，1962年生，教授，博士，研究方向为金属腐蚀与防护

通讯作者E-mail: lianjia198687@sina.com

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