

表面与界面工程

## 304不锈钢管焊缝区碱性腐蚀的电化学噪声检测

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摘要

利用电化学电位噪声检测304不锈钢管焊缝区在50%NaOH碱液沸腾温度下腐蚀过程的电位噪声谱,观测相应的腐蚀形貌,分析电化学噪声谱特征参数。结果表明:实验过程中焊缝处腐蚀电位呈下降趋势;发生局部腐蚀裂纹时,电位噪声时域谱振幅较大,出现暂态峰;经快速傅里叶变换(FFT)后的功率密度(PSD)谱出现高频白噪声水平,PSD谱高频线性部分的斜率 $K > -20 \text{ dB} \cdot \text{dec}^{-1}$ 。测试室温碱液中304不锈钢管焊缝处的电化学噪声表明,不同腐蚀状态的焊缝试样腐蚀电位及噪声时域谱特征不同,可利用 $K$ 值定性判定是否发生局部腐蚀,为现场检测奠定基础。

关键词

[电化学噪声](#) [检测](#) [不锈钢](#) [焊缝](#) [碱性腐蚀](#)

分类号

## Detection of alkaline corrosion in 304 stainless steel weld zone by electrochemical noise

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### Abstract

Electrochemical noise was used to detect the corrosion process of the weld zone of 304 stainless steel (SS) in 50% NaOH solution at boiling point, its morphology was observed and its characteristic parameters were analyzed. The result showed that the weld's corrosion potential dropped from -445 mV to below -560 mV during the experiment. When localized corrosion cracking was initiated, the amplitude was large and termination appeared. A high frequency plateau appeared in the power spectrum by use of the fast fourier transform (FFT) and high frequency roll-off slope  $K > -20 \text{ dB} \cdot \text{dec}^{-1}$  in the power spectral density (PSD) plot. Electrochemical noise of 304SS specimens at room temperature in 50% NaOH solution showed that different specimens had different corrosion potentials and electrochemical potential noise time spectra. The noise was produced by fluctuations in the electrochemical process and larger fluctuations would typically be indicative of a more localized process. Moreover, the use of the roll-off slope  $K$  in the PSD plot could detect whether the localized corrosion occurred or not. Further development work is expected to lead to a useful, real time detection of localized corrosion.

### Key words

[electrochemical noise](#) [detection](#) [stainless steel](#) [weld](#) [alkaline corrosion](#)

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