

# Accepted Manuscript

Full Length Article

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PII: S0169-4332(18)30707-4  
DOI: <https://doi.org/10.1016/j.apsusc.2018.03.047>  
Reference: APSUSC 38795

To appear in: *Applied Surface Science*

Received Date: 25 November 2017  
Revised Date: 8 February 2018  
Accepted Date: 6 March 2018

Please cite this article as: L.Q. Guo, B.J. Yang, J.Y. He, L.J. Qiao, Local electrical properties of thermally grown oxide films formed on duplex stainless steel surfaces, *Applied Surface Science* (2018), doi: <https://doi.org/10.1016/j.apsusc.2018.03.047>

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## Local electrical properties of thermally grown oxide films formed on duplex stainless steel surfaces

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**Abstract** The local electrical properties of thermally grown oxide films formed on ferrite and austenite surfaces of duplex stainless steel at different temperatures were investigated by Current sensing atomic force microscopy, X-ray Photoelectron Spectroscopy (XPS) and Auger Electron Spectroscopy (AES). The current maps and XPS/AES analyses show that the oxide films covering austenite and ferrite surfaces formed at different temperatures exhibit different local electrical characteristics, thickness and composition. The dependence of electrical conductivity of oxide films covering austenite and ferrite surface on the formation temperature is attributed to the film thickness and semiconducting structures, which is intrinsically related to thermodynamics and kinetics process of film grown at different temperature. This is well elucidated by corresponding semiconductor band structures of oxide films formed on austenite and ferrite phases at different temperature.

**Keywords:** Duplex stainless steel; Oxide film; Current sensing atomic force microscopy; AES; XPS; Semiconductor

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