

# Enhanced Understanding of Corrosion Performance in Lean Duplex Stainless Steel Exposed to Aging Treatment and Mechanical Stress

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**Abstract :** This paper investigates the influence of heat treatment and mechanical stress on the microstructure, magnetic characteristics, and corrosion resistance of 2101 lean Duplex Stainless Steel (DSS). Specifically, at a temperature of 750°C during the aging treatment, the emergence of the sigma phase, in conjunction with mechanical stress, leads to material embrittlement. The study explores the applicability of employing Vibration Sample Magnetometer (VSM) and eddy current testing to detect microstructural modifications and evaluate corrosion behavior. Corrosion effects are analyzed using potentiodynamic methods (PM). Notably, a robust correlation is established between the proportion of sigma phases and electrochemical parameters. The samples are subjected to a range of conditions, including untreated states, exposure to elevated temperatures, corrosive environments, and axial loading. Material responses are meticulously examined utilizing eddy current techniques. This investigation compellingly demonstrates the capacity to identify and quantify all microstructural alterations in the samples through magnetic measurements.

**Keywords :** LDX 2101, corrosion, aging treatment, microstructure, Mechanics stress, VSM, Hysteresis Loop, Eddy Current