Estimating the Degree of Stainless Steel Sensitization in Microstructures Using Image Processing

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The evaluation of austenitic stainless steel sensitization degree is usually performed by visual comparison of microstructure images to databases of similar materials [1,2]. This procedure carries high level of subjectivity producing non normalized results. Well known commercial softwares usually characterize the corrosion patterns using grain size measurement, graphite morphology, particle size measurement and nodularity assessment. Digital image processing (DIP) techniques have been successfully employed to atmospheric corrosion detection in [3, 4]. The use of pattern recognition (PR) for sensitization characterization was assessed in [5, 6]. In this work we propose a DIP methodology based on mathematical morphology for grain border segmentation in microstructure images of stainless steel materials. Image processing techniques are used to segment grain boundaries and eliminates the artifacts that usually decrease the precision of the sensitization estimation. As result of this segmentation, a quantitative degree of sensitization can be estimated as a value proportional to the sensitized area. This approach uses a deterministic measure of the sensitization degree which provides an efficient tool the expert evaluation abstracting the subjectivity. This study leads to a framework that can be used in a variety of stainless steel nondestructive sensitization analysis, including methods for automatic image database retrieving and characterization.

Keywords: austenitic stainless steel, sensitization, image processing.


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