
This is an electronic reprint of the original article.
This reprint may differ from the original in pagination and typographic detail.

Shekh Mohammad, Arju; Casanova, Jaime; J. S. de Souza, Gustavo ; Santos Vilaca da Silva, Pedro; Brandi, Sérgio Duarte

Microstructural characterization of alloy 926 and 2205 duplex stainless steels coating layers deposited over high strength steel by friction surfacing

Published in:
71st Annual Assembly of International Institute of Welding

Published: 15/07/2018

Document Version
Publisher's PDF, also known as Version of record

Please cite the original version:
Shekh Mohammad, A., Casanova, J., J. S. de Souza, G., Santos Vilaca da Silva, P., & Brandi, S. D. (2018). Microstructural characterization of alloy 926 and 2205 duplex stainless steels coating layers deposited over high strength steel by friction surfacing. In *71st Annual Assembly of International Institute of Welding* Article III-1887-18

This material is protected by copyright and other intellectual property rights, and duplication or sale of all or part of any of the repository collections is not permitted, except that material may be duplicated by you for your research use or educational purposes in electronic or print form. You must obtain permission for any other use. Electronic or print copies may not be offered, whether for sale or otherwise to anyone who is not an authorised user.

Microstructural characterization of alloy 926 and 2205 duplex stainless steels coating layers deposited over high strength steel by friction surfacing

Arju Shekh¹, Jaime C. Soeiro Jr.², Gustavo J. S. de Souza², Pedro Vilaça^{1,a}, Sérgio D. Brandi²

¹ Department of Mechanical Engineering, School of Engineering, Aalto University, Espoo, Finland.

² University of São Paulo, Escola Politécnica, Department of Metallurgical and Materials Engineering, São Paulo, Brazil.

^a Presenting author

Abstract

Friction surfacing (FS) is a solid state processing technique used to deposit thick coating layers over a substrate enabling several metallic combinations. FS can be used in the production of new components or as a repair technique, typically to recover base metals from corrosion or wear loading. In this paper, UNS N08926 and UNS S32205 duplex stainless steels were investigated as consumable rods for coating a substrate made of S700MC grade high strength steel. The FS was applied under controlled plunging speed. Rods with dimensions of 180 mm long and 12 mm in diameter were used to deposit a coating with approximately 100 mm in length. The rods were made of duplex stainless steels. An L-9 Taguchi experimental design was used to optimize and study the effect of the rod rotational speed, the rod feed speed (V_z), and the travel speed (V_x) on the coating geometrical characteristics and its microstructure. The rotational speed was changed from 1500 to 2500 rpm, the plunging speed from 2.0 to 3.0 mm/s and the traverse speed from 350 to 550 mm/min. The FS was done without inert gas protection. The geometry of the resulting coating was characterized by a stereoscopic equipment. The microstructures were analyzed by optical microscopy and by EBSD technique, at center, advancing side and retreating side. The thermal profiles were assessed by IR camera and thermocouples. Results show a difference in the austenite volumetric fraction using both characterization techniques, but the trend of the results were similar. Both duplex stainless steels presented an austenite percentage lower than the original rods percentages. In the case of UNS N08926, the minimum volumetric fraction was 1.0% and the maximum austenite content was 18.0%, compared to 26.0% in the original rod. For UNS S32205, the minimum value was 20.0% and the maximum austenite volumetric fraction was 40.0%, compared to 48.0% in the original rod. Also, the amount of austenite at the advancing side was larger than at the retreating side, and both larger than at the middle of the coating. These results can be explained by the thermal cycles and by the plastic deformation. The optimal welding parameter maximized the volumetric fraction of austenite in the three regions of the FS coating.

Keywords: Friction surfacing; Duplex stainless steel; UNS N08926; UNS S32205; S700MC HSS