Title: Metal-cored welding wire for minimizing weld porosity of zinc-coated steel

Authors: Jiyoung Yu, Seung Mok Cho

PII: S0924-0136(17)30240-6
DOI: http://dx.doi.org/doi:10.1016/j.jmatprotec.2017.06.012
Reference: PROTEC 15265

To appear in: *Journal of Materials Processing Technology*

Received date: 24-1-2017
Revised date: 4-6-2017
Accepted date: 8-6-2017

Please cite this article as: Yu, Jiyoung, Cho, Seung Mok, Metal-cored welding wire for minimizing weld porosity of zinc-coated steel.Journal of Materials Processing Technology http://dx.doi.org/10.1016/j.jmatprotec.2017.06.012

Title

Metal-cored welding wire for minimizing weld porosity of zinc-coated steel

Authors

Jiyoung Yu*[1], Seung Mok Cho[2]

[1] Technical Research Center, Hyundai Steel Company, 1480 Bukbusaneop-ro, Songak-eup, Dangjin-si, Chungcheongnam-do, 31719, South Korea

[2] Welding R&D Center, Hyundai Welding Company, 100, Daesong-ro, Nam-gu, Pohang-si, Gyengsangbuk-do, 37863, South Korea

*Corresponding author: Jiyoung Yu

Tel.: +82 41 680 8355; Fax: +82 41 680 8568; Mobile phone: +82 10 5659 9234

E-mail address: susagye80@hyundai-steel.com

Abstract

Metal-cored welding (MCW) wire with an optimal chemical composition was developed to minimize the weld porosity and pits in the cold metal transfer welding of hot-dip galvannealed steel in a lap-joint configuration. The effects of the chemical composition of the welding wire (specifically, the effects of the C, Si, and Mn contents) on the weld porosity formation were investigated through statistical analysis, high-speed imaging of the weld pool behavior, and welding signal analysis. The Si and Mn contents were found to be significant factors in reducing the weld porosity and pits. As the Si and Mn contents decreased, the viscosity of the weld pool decreased and the Zn vapor emission increased. The electrical resistance of the wire also decreased with decreasing Mn content. Although the C content rarely affected the emission of Zn vapor, it affected the hardness of the welds. The response surface model between the wire elements and weld porosity was also estimated, and the chemical composition of the wire was optimized based on this model. The optimal MCW wire with low Si and Mn contents (0.08% C–0.30% Si–0.51% Mn) was fabricated, and its effectiveness in reducing weld porosity was experimentally verified.