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Influence of Vanadium on the Hydrogen Embrittlement of Aluminized Ultra-High Strength Press Hardening Steel

Lawrence Cho^{a,1,*}, Eun Jung Seo^{a,2}, Dimas H. Sulistiyono^a, Kyoung Rae Jo^a,
Seong Woo Kim^b, Jin Keun Oh^b, Yeol Rae Cho^b, Bruno C. De Cooman^{a,3}

^aGraduate Institute of Ferrous Technology, Pohang University of Science and Technology,
Pohang, 37673, South Korea

^bTechnical Research Laboratories, POSCO, Gwangyang, 57807, South Korea

¹Current address: National Institute of Standards and Technology, Boulder, CO 80305, USA

²Current address: Advanced Steel Processing and Products Research Center,
Colorado School of Mines, Golden, CO 80401, USA

³Current address: R&D NLMK Group, Moscow, 119017, Russia

*Email: lawrence.cho@nist.gov

Tel: +1-303-497-6853

Abstract

Improved safety standards and reduced automotive body-in-white weight have led to a strong interest in martensitic press hardening steel (PHS). As the sensitivity to hydrogen embrittlement of martensite increases at higher strength level, the very small uptake of diffusible hydrogen by aluminized PHS during the austenitization stage of the hot press forming process is of concern. The hydrogen uptake was found to reduce the plasticity of the PHS considerably. The PHS with a higher strength was more susceptible to hydrogen-induced brittle fracture. The present work reports that vanadium additions, which serve to trap the hydrogen, considerably reduce the negative impact of the hydrogen uptake in aluminized 1800MPa and 2000MPa PHSs. The contribution also proposes a mechanism for the uptake of hydrogen during the processing of aluminized PHS.

Keywords: hydrogen embrittlement; press hardening steel; aluminizing; vanadium

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