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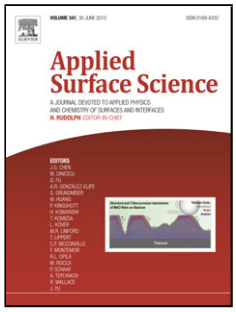

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ACCEPTED MANUSCRIPT

Characterizing AISI 1045 steel surface duplex-treated by alternating current field enhanced pack aluminizing and nitriding

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Highlights

- Alternating current field is used to enhance pack aluminizing followed by nitriding.
- Reactions of N with aluminizing case lead to a hard nitriding case in carbon steel.
- Thicker cases can be efficiently formed by using alternating current field (ACF).
- Phases and hardness distribution of the duplex-treated case are improved with ACF.

Abstract: Thin cases and long treating time are shortcomings of conventional duplex treatment of aluminizing followed by nitriding (DTAN). Alternating current field (ACF) enhanced DTAN was carried out on AISI 1045 steel by applying an ACF to treated samples and treating agents with a pair of electrodes for overcoming those shortcomings. By investigating cases' structures, phases, composition and hardness distributions of differently treated samples, preliminary studies were made on characterizations of the ACF enhanced duplex treatment on AISI 1045 steel. The results show that, with the help of the ACF, the surface Al-rich phase Al_5Fe_2 formed in conventional pack aluminizing can be easily avoided and the aluminizing process is dramatically promoted. The aluminizing case can be nitrided

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