Transactions of the IMF ›
The International Journal of Surface Engineering and Coatings
Volume 101, 2023 - Issue 3

Articles

Optimisation and analysis of jet impingement erosion behaviour of composite titanium based electroless nickel ENi-P coated naval steel (AH36)

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Pages 140-149 | Received 12 Aug 2021, Accepted 14 Sep 2022, Published online: 17 Apr 2023

Cite this article https://doi.org/10.1080/00202967.2023.2185972 Check for updates

ABSTRACT

This paper aims to address the impact of jet impingement on nano titanium-based ENi-P composite coatings deposited through electroless deposition on AH36 steel through Taguchi design of experiments. L9 Taguchi DOE was utilised to synthesise nine coatings by varying the four process parameter combinations suggested by the technique. Jet impingement combined with AFS 50/70 quartz sand erosion experimental run was conducted on the acidic, alkaline and nine ENi-P-TiO_2 composite coatings administered through a waterjet erosion tester. The influence of C14-SB type Zwitterionic surfactant and nano TiO_2 were discussed along with

the surface of the coatings. Analysis of variance, the S/N ratio, and interaction plots were used to determine the optimal bath input parameters to deliver the least weight loss from the erosive environment and identify its use in the marine environment. The proposed optimal coating was validated using a confirmation test, and the weight loss was reduced by more than 35% compared to the initial condition parameter (A2B2C2D2). In addition to mechanical properties, the quality of the deposits was analysed through morphological and chemical composition probed through scanning electron microscope, energy dispersive X-Ray analysis and powder X-Ray diffraction methods. As a result, the Composite Modified Resilience **(**CMR) value of ENi-P-TiO_2 optimal coating was improved by over 41.17%, and its corresponding weight loss was reduced to 35% compared to the initial condition. This experiment paves the way for further study on electroless deposits and their characteristics on AH36 steel generally used for shipbuilding in commercial ships, naval, and marine associated defence applications.

KEYWORDS:

AH36 steel ENi-P-TiO_2 composite coatings morphology erosion composite modified resilience

Acknowledgements

R. Anthoni Sagaya Selvan, one of the authors, wishes to express his gratitude to the Centre for Materials Joining and Research (CEMAJOR), Department of Manufacturing Engineering, Annamalai University, for extending laboratory facilities to conduct this study during ongoing pandemic situations. Additionally, this study would not have been possible without the exceptional support of Comdt JG AK Pandey, Commanding Officer, ICGS Ameya, Indian Coast Guard.

Disclosure statement

No potential conflict of interest was reported by the author(s).

ANN for design and fabrication of ENi-P-nano TiO2 coatings on AH36 steel ›

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Materials Science and Technology
Published online: 4 Apr 2023