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Sliding wear of sic reinforced duplex stainless steel via tig torch surface melting technique

(Article)

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Abstract

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Background: Duplex stainless steel (DSS) has gained increasing interest in recent years for a number of applications as structural materials in various industrial sectors of the petrochemical process plant, marine engineering and automotive industries. However, this material has experienced hardness and wear failure in the service. Therefore, new development in the surface modification for DSS is required to explore the possibility of producing a hard modified surface layer of SiC resolidi-fied layer by TIG torch surface melting technique. Methods: TIG torch surface melting technique was performed on DSS substrate with preplaced SiC reinforcement. The effects of particle size, SiC preplacement, heat input and shielding gas flow rate on surface topography, hardness and wear rate were investigated through several characterization-sand tests. Results: Inspection of the surface topography reveals rippling marks which proved that the re-solidification process occurred during the TIG torch surface melting technique. The obtained result showed that the preplacement of SiC reinforcement on DSS via TIG torch surface melting technique could increase the hardness of DSS by ~ five times. From Taguchi analysis, the optimum combination of parameters obtained for the lowest wear rate of surface layered DSS was: preplacement rate, 1.5 mg/mm^2, SiC particles size, 60 μm; heat input, 720 J/mm; and gas flow rate, 15 L/min. Conclusion: The results of this study confirmed that conventional TIG torch melting technology may be used as an alternative to the more expensive laser or plasma technique to create a new composite surface layer on DSS material.

SciVal Topic Prominence

Topic: Laser Cladding | Composite Coatings | Stellite (Trademark)

Prominence percentile: 98.307

Author keywords

Duplex stainless steel | Hardness | Particulate SiC | Surface topography | TIG technique | Wear rate

Indexed keywords

Engineering controlled terms: Flow of gases | Hardness | Marine applications | Marine engineering | Marine industry | Melting | Particle size | Particle size analysis | Silicon | Silicon carbide | Silicon compounds | Surface topography | Topography | Wear of materials

Engineering uncontrolled terms: Composite surface | Duplex stainless steel (DSS) | Industrial sector | Modified surfaces | Optimum combination | Petrochemical process | Plasma techniques | SiC reinforcement

Engineering main heading: Duplex stainless steel

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