Wear Characteristics of LAM-Processed Hybrid eSiC-GO Coated Ti-Alloy

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Abstract

This study concentrates on the wear characteristics of Ti-alloy coated with environmentally friendly silicon carbide-graphene oxide (eSiC-GO) using the liquid additive manufacturing (LAM) technique. Waste rice husk was utilized to extract eSiC material. The hybrid coating of eSiC-GO on Ti-6Al4V alloy was synthesized via LAM technique. Nine wear test samples were obtained from the Taguchi design of experiments variety of process parameters including current (70, 80, and 90 A), voltage (20, 25, and 30 V), gas flow rate (15, 20, and 25 L/min), eSiC-GO composition (95-5, 90-10, and 85-15 wt%), and a fixed traverse speed (1 mm/s). An analysis of variance (ANOVA) was performed using design software to ascertain the optimal parameter levels for the LAM technique. Optimal hardness, friction, and wear were achieved in experimental run 8, as evidenced by the experimental results. The findings conclude eSiC-GO coated LAM-processed significantly enhanced friction and wear properties. LAM integrates sustainable materials with additive manufacturing advantages to develop hybrid coatings that augment friction and wear resistance. Consequently, aerospace, automotive, and energy can make tangible and measurable contributions to the United Nations' Sustainable Development Goals. © 2025 The Authors.