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DRY SLIDING CHARACTERISTICS OF MG-WC NANO-COMPOSITES USING GREY RELATIONAL OPTIMIZATION

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ABSTRACT

In the current study, Mg-WC nanocomposites with different weight percentage of WC (1%, 1.5% and 2%) are developed by ultrasonic vibration assisted stir casting technique. Optical microscope (OM), Scanning electron microscope (SEM) and Energy dispersive x-ray analysis (EDAX) studies are conducted to characterize the developed materials. SEM micrographs ensure the presence and distribution of WC particles while EDAX spectra provide basic compositional details. Taguchi based grey relational optimization is considered to optimize wear and friction characteristics by using three control parameters (wt.% of WC, applied load and sliding speed) at three levels each. Wear rate and coefficient of friction (COF) are taken as response variables. Wear rate and COF are converted into grey relational grade and Taguchi based L_{27} OA is used to achieve optimal condition for minimized wear rate and COF. Optimal condition for minimized wear rate and COF is obtained as highest levels of both wt.% of WC and applied load along with lowest level of sliding speed. Significance of process parameters is obtained using ANOVA and confirmation tests validate the model. It is seen that applied load is the most significant parameter and sliding speed has moderate significance. Confirmation test discloses that grey relational grade is improved by 35.64% compared to initial condition. Finally SEM and EDAX analysis of worn surfaces reveals that delamination and oxidation are main wear mechanisms.

Keywords: Mg-WC, nano-composite, wear rate, COF, grey analysis

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