Materials Science & Engineering Doctoral Defense

Novel approach for surface roughness quantification and optimization of cast-on-straplead-antimony alloy via two-point statistical correlation function

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Abstract

Surface roughness has a negative impact on several failures of materials medium.It can accelerate the pitting corrosion, increase effective heat transfer and increase therate of effective charge loss. However, controlled surface roughness may be desirable in many situations. The automotive lead-acid battery is a very sensitive application to such an effect. Cast-on-strap machine has the largest effect on the surface roughness of the alloy in our case study. The two-point correlation function is an efficient characterization tool for two-phase heterogeneous materials. Considering the nature that the two-point correlation function isa spatial statistical function, it cannot distinguish between a two-phase material ormaterials with surfaces containing protrusion of distinct heights. A case study to examineits capability in quantifying surface roughness is introduced. The possibility of applying asimulated annealing procedure to optimize using information obtained from the two-pointcorrelation function is investigated. Outcomes show a successful surface representation,as well as optimization, that agrees with the initially proposed hypothesis.

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Zoom Link: https://asu.zoom.us/j/87367426153