Vibration Damping Behavior and Surface Characterization of Magneto-Mechanical Powder Coated AISI304 Stainless Steel

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Abstract
In this research work, air plasma sprayed magneto-mechanical powder Fe16%Cr 2%Al is coated on AISI304 stain-less steel for 50μm, 100μm and 150μm coating thickness. Dynamic mechanical analysis (DMA) was carried out using three-point bending method and damping capacity (Q^{-1}) with respect to stress, strain and time are com-pared with the uncoated sample. Test results revealed that coating has improved damping capacity in all the cases and is attributed to the porosity. SEM, EDX and XRD analysis was carried out to study the morphology and coating composition of the diffused material into the substrate surface. SEM images showed that coated surface has a mixture of pores, effective splats, and fewer unmelted particles. Magnetic force microscopy images which were obtained for magnetic domain wall measurements showed that domain walls have no influence on the damping capacity due to the fact that the average domain wall thickness remaining same in all the cases. Coating adhesion strength and behavior of coating was evaluated using scratch test for constant load and varying load. This has revealed that cracks are predominant due to continuous spread of porosity with thick splats. Increasing load in the tests showed that coating is effective with the diffused magneto-mechanical material.

Keywords
Coating
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Scratch
Stainless steel