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Wear Behavior and Microstructure of Eutectic Al - Si Alloys Manufactured by Selective Laser Melting

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Abstract : In this study, the almost dense eutectic Al-12Si alloys were fabricated by selective laser melting (SLM) from the powder mixture of pure Aluminum and pure Silicon, which show the mean particle sizes of 30 µm and 5µm respectively, under the argon environment. The image analysis shows that the highest value of relative density (95 %) was measured for the part obtained at the laser power of 280 W. X ray diffraction (XRD), Optical microscope (OM) and scanning electron microscope (SEM) equipped with X-ray energy dispersive spectroscopy (EDS) were employed to determine the microstructures of the SLM-processed Al-Si alloy, which illustrate that the SLM samples present the ultra-fine microstructure. The XRD results indicate that no clearly phase transformation happened during the SLM process. Additionally, the vaporization behavior of Aluminum was detected for the parts obtained at high laser power. Besides, the maximum microhardness value, about 95 Hv, was measured for the samples obtained at laser power of 280 W, and which shows the highest wear resistance.

Keywords : al-Si alloy, selective laser melting, wear behavior, microstructure
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