

# MICROSTRUCTURAL EVOLUTION OF LASER METAL DEPOSITED 17-4 PH SS-TUNGSTEN COMPOSITE WITH VARYING VOLUME PERCENT TUNGSTEN

A. A. Adeyemi<sup>1</sup>, E.T. Akinlabi<sup>1</sup>, R. M. Mahamood<sup>1,2\*</sup>

<sup>1</sup>Department of Mechanical Engineering Science, University of Johannesburg, South Africa

<sup>2</sup>Department of Mechanical Engineering, University of Ilorin, Nigeria

\*Corresponding author's e-mail address: mahamoodmr2009@gmail.com

## ABSTRACT

*This study investigates the influence of the quantity of tungsten powder on the microstructural evolution of 17-4 PH stainless steel-tungsten composite produced using laser metal deposition process. The 17-4 PH stainless steel and tungsten powders were deposited on 316 stainless steel substrate at laser power of 2600 W. The tungsten powder flow rate was varied between 0.5 rpm and 2.0 rpm while 17-4 PH stainless steel powder flow rate, the scanning speed, the gas flow rate and the laser spot size were fixed at 2.0 rpm, 0.5 m/s, 2.5 l/min and 2.0 mm respectively. Five (5) multiple tracks of 17-4 PH stainless steel and tungsten powder were deposited on 316 stainless steel of 10 mm thickness from different hopper at 50% overlapping percentage to produce 17-4 PH SS-W composite. During the microstructural study, it was observed that tungsten carbide has been precipitated in-situ and evenly dispersed in the 17-4 PH SS-W composite produced. SEM and EDS analyses also revealed the presence of BCC alpha ( $\alpha$ ) ferrite and FCC gamma ( $\delta$ ) ferrite with the presence of sigma ( $\sigma$ ) phase precipitates.*

**KEYWORDS:** Laser Metal Deposition, Laser power, microstructure, precipitation, hardening, stainless steel, composite, tungsten.

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