Investigation on microstructure and hardness of aluminium-aluminium oxide functionally graded material

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ABSTRACT

This study investigated the microstructure and hardness of aluminium-aluminium oxide (Al-Al2O3) functionally graded material (FGM). Preparation of metal-ceramic functionally graded material was carried out following powder metallurgy (PM) route. Four-layered aluminium-aluminium oxide (Al-Al2O3) graded composite structure was processed using 0%, 5%, 10% and 15% (from first layer to fourth layer) aluminium oxide as ceramic concentration. A cylindrical steel die was used for the fabrication process of the FGM green compact. The green compact was prepared by applying cold pressing technique using a hydraulic press. The sintering process was implemented at 600 °C sintering temperature and 3 h sintering time using 2-step cycle. Microstructural characterization of the sample was conducted layer by layer using high resolution optical microscopy (OM). Hardness of the sample was also performed layer by layer using Vickers microhardness tester. The obtained results revealed that there is a uniform ceramic particle distribution within the metallic phase. From the microstructural observation it was clear that smooth transition occurred from one layer to next layer and each interface was distinct. It was also observed that there is a steady increase in layer hardness with the increase in ceramic concentration.

KEYWORDS

Aluminium oxide; Aluminum; Hardness; Microstructure

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