

MICROSTRUCTURE AND MICROHARDNESS OF BALL MILLED/HOT PRESSED ALUMINIUM WITH Mg_3N_2 ADDITION

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ABSTRACT

The microstructure and microhardness of a ball milled and hot pressed aluminium powder with 10 vol.% of magnesium nitride (Mg_3N_2) were investigated. It was expected that the addition of a Mg_3N_2 as a nitrogen-bearing substrate would allow to obtain an in situ reaction leading to a formation of an aluminium nitride (AlN) strengthening phase. The powders were milled in a high energy planetary ball mill for up to 40 h and then compacted in vacuum at 400°C/600 MPa. The material was investigated by means of X-ray diffraction measurements (XRD), scanning electron microscopy (SEM), transmission electron microscopy (TEM) and microhardness tests. The performed investigations showed that the composite preparation method provided a significant structure refinement of the material - the average matrix grain size of composite compact was about ~140 nm. EDS chemical analysis of Al/ Mg_3N_2 compact combined with X-ray diffraction technique indicated a presence of Mg_3N_2 as well as Mg-Al-O phase, which was probably formed during hot pressing. Microhardness tests showed nearly 40% increase in the hardness of Al/ Mg_3N_2 composite over the non-reinforced aluminium compact.