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Development of Aluminium Reinforced Milled Carbon Fibre Composites via Magnetically Controlled Ball Milling: Manufacturing and Characterisation

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Abstract:

Aluminium reinforced with different volume fractions of milled carbon fibres (MCFs) were manufactured via advanced powder metallurgy processing method. Composites containing 5, 10, 15 and 20 % volume fraction of MCFs were prepared using the Uniball magneto



milling technique. Full density cylindrical compacts were produced by uniaxial hot pressing (UHP) at 600°C for a dwelling time close to 15 minutes. Characterization was done using x-ray diffractometry (XRD) and Field Emission Scanning Electron Microscopy (FSEM). The mechanical and physical properties were determined by compression testing, Vickers hardness, and Archimedes density. Uniball milling of blends resulted in decrease of aspect ratio of the MCFs and refinement of the Al grain size. Results show slight uniform distribution of MCFs in Al matrix for higher volume fractions without discernible porosity. In samples containing low volume fractions of MCFs (5% and 10%) fibres tended to be pushed towards grain boundaries during grain growth. In samples with higher volume fraction of MCFs (15 and 20%) a more uniform distribution of MCFs in the product was obtained. The compressive strength of the composites was enhanced by the fibres, attributable to good interface bonding and wetting

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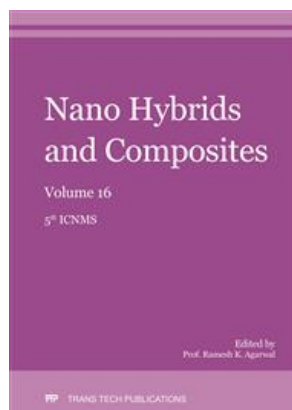
between the matrix and the reinforcement fibres. The combination of controlled ball milling and UHP techniques has facilitated the development of Al-MCFs composites potentially to be used in automobile industries.



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Info:

Periodical: Nano Hybrids and Composites (Volume 16)

Pages: 13-19

DOI: <https://doi.org/10.4028/www.scientific.net/NHC.16.13>

Citation: [Cite this paper](#)

Online since: June 2017

Authors: [Buraq Al-Mosawi*](#), [David Wexler](#), [Andrzej Calka](#)

Keywords: [Al Metal Matrix Composites](#), [Al-Carbon Fibres](#), [Composites](#), [Mechanical Milling](#), [Metal Matrix Composites](#), [Uniaxial Hot Pressing](#)

Export: [RIS](#), [BibTeX](#)

Price: 39,50 €



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