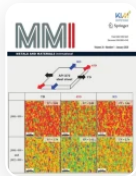


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Characterization and Properties of Aluminium Reinforced Milled Carbon Fibres Composites Synthesized by Uniball Milling and Uniaxial Hot Pressing

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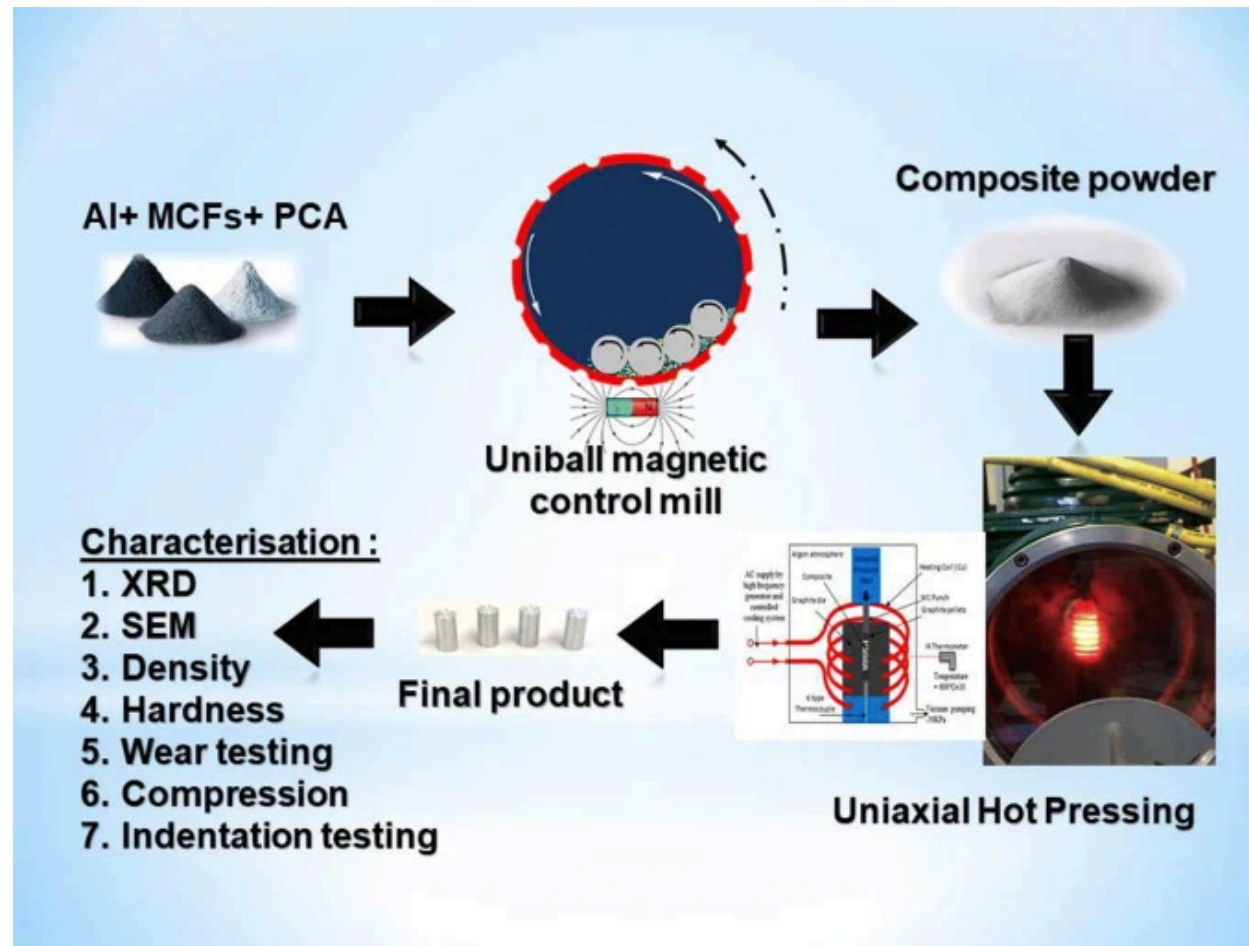


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Abstract

Al-matrix composites reinforced with variant quantity of milled carbon fibers (MCFs) were manufactured via uniball magneto milling and uniaxial hot pressing (UHP). Cylindrical compacts of these composites were produced at approximately 600 °C for 15 min and 70 MPa uniaxial pressure in an argon atmosphere. The microstructure of powders and consolidated composite samples were studied by X-ray diffractometry and field emission scanning electron microscope with energy dispersive spectroscopy. The physical and mechanical properties of the bulk samples were estimated by Archimedes density, Vickers microhardness, modulus of elasticity, maximum compressive strength, yield strength, nanoindentation, and specific wear rate. Results show that Al + 20 vol% of MCFs has a higher compressive strength of (710 ± 32) MPa and modulus of elasticity of (15 ± 2) GPa compared to other composites and unreinforced Al sample. There are several factors that could be participate in improving the composite properties. These reasons included enhanced interface between Al matrix and MFCs, free of porosity, refined microstructure, and improved wetting between MFCs and Al matrix. Also, the specific wear rate of the composite was decreased when the MCFs volume fraction increases from 5 to 20%. This might propose that MFCs reduced the wear of the composites by acting as a self-lubrication material and might be suggested when using these types of composites in components sliding against hard surface. The notable composite properties were found at processing parameters of 50 h milling time and UHP at 600 °C for 15 min under 70 MPa applied pressure.

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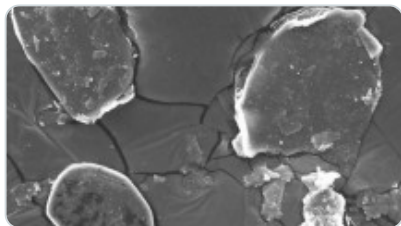
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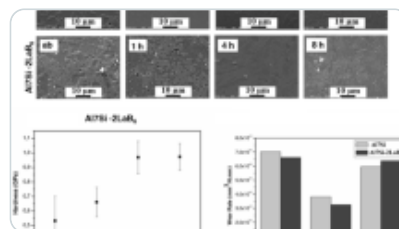
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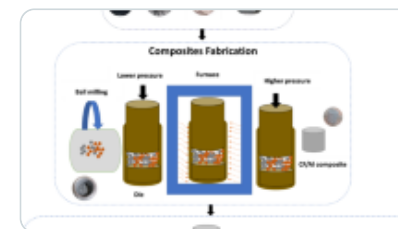
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