

# Mechanical and Physical Properties of Selected Mg Composites and Nanocomposites

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## **ABSTRACT**

The influence of Inconel 718 particles and various nanoparticles (BN, Al<sub>2</sub>O<sub>3</sub>, ZrO<sub>2</sub>, LaB<sub>6</sub>, ZrB<sub>2</sub>) on the mechanical and physical properties of magnesium has been investigated in this complex study. Ultrafine grained magnesium reinforced with nanoparticles was prepared by ball milling and hot extrusion. Magnesium samples reinforced with 0.7, 1.4 and 2.4 vol% of Inconel 718 particles were prepared using disintegrated melt deposition technique followed by hot extrusion.

The microstructures including grain size was analyzed using a FEI Quanta 200 FX scanning electron microscope equipped with EDAX EBSD camera and OIM software was utilized for EBSD observations. The phase and texture analysis was performed using X-ray diffractometer. Microhardness of samples was studied at room temperature, tensile and compression tests were performed at temperatures from room temperature up to 300 °C.

The true stress-true strain curves were determined. The flow stress is significantly influenced by test temperature; it is rapidly decreasing with increasing temperature. A substantial asymmetry in the tensile and compressive properties was observed.

The linear thermal expansion (coefficient) of studied materials was measured over a wide temperature range from room temperature up to 400 °C. Pre-deformation in both tension and compression was used to estimate the influence of dislocations and twins on the thermal expansion coefficient of nanocomposites. Internal friction was measured depending on the nanoparticles (particles) content. The results are analyzed and possible physical mechanisms are discussed.

## **BIOGRAPHY**

Zdeněk Drozd is an associate professor at the Charles University, Faculty of Mathematics and Physics, Prague, Czech Republic. He received his PhD from Charles University, Faculty of Mathematics and Physics in 2000 (General problems in physics) and he was promoted to an associate professor at the same institution in 2008 (Physics of condensed matter). His research interests include mechanical and physical properties of magnesium alloys and magnesium base composites and nanocomposites. He is active also in the field of physics education. He was involved in several international programs focused on physics education and popularization of physics. His results in above mentioned areas of interest were presented in various journals and conferences (100 publications, approximately).

