NanoMat 09 MÉXICO Instituto Politécnico Nacional
IV Workshop on metastable and nanostructured materials
August 23-26, 2009
IPN-ESIQIE, Mexico City

SYNTHESIS AND MECHANICAL CHARACTERIZATION ON ALUMINUM-BASED COMPOSITES PREPARED BY MECHANICAL MILLING AND POWDER METALLURGY.

I. Estrada-Guel*, **, J. L. Cardoso**, C. Careño-Gallardo*, **, J. M. Herrera-Ramirez*, M. Miki-Yoshida* and R. Martínez-Sánchez*

*Centro de Investigación en Materiales Avanzados (CIMAV), Laboratorio Nacional de Nanotecnología, Miguel de Cervantes No. 120, CP 31109, Chihuahua, Chih., México.

**Universidad Autónoma Metropolitana, Departamento de Materiales, Av. San Pablo # 180, Col Reynosa-Tamaulipas CP 02200, México, D. F.

Considerable efforts have been made in the investigation for the development of aluminum-based materials of high resistance, which would be able to satisfy the necessities of the modern industry. Al-based composites are excellent alternatives due to the fact that small quantities addition of insoluble reinforcing particles into aluminum or its alloys, offers the opportunity to increase some important mechanical properties like elastic module, yield and maximum stress, and deformation percent. Al-based composites are potential candidates for a great variety of applications like structural applications in automotive and electrical conductors industry to mention some of them.

In the present work, some Al-based composites reinforced with metallized-graphite particles (Cu), were fabricated by a solid state route in high energy-ball mill (Simoloyer). Composites were prepared using two experimental variables: additive concentration (0, 0.5 and 1.0 wt. %) and milling intensity (0, 1, 2, 4 and 8h).

The processed powders were characterized by x-ray diffraction, optical and scanning electron microscopy in order to follow its microstructural evolution. Another fraction of the samples were consolidated by the follow sequence: first a cold isostatic pressing (960 MPa) and then a sintering process under argon atmosphere at 823 K for 3h with the purpose of obtain some solid cylindrical samples to carry out the mechanical testing. Also a reference sample was prepared from un-milled powder and same experimental sequence. On the other hand, complementary hardness, tensile and compression tests were performed on extruded and machined samples.

Microstructural and mechanical characterization reveals that, by milling, it is obtained a homogeneous dispersion of insoluble particles into the aluminum matrix; this produced an important improvement of hardness and strength values respect to reference sample. Some intrinsic material properties are modified as function of milling intensities. However, an adverse effect was observed with extended milling time and high additive concentration.

Corresponding author: roberto.martinez@cimav.edu.mx