Sintering and Microstructure of CNTs Dispersed Al_2O_3/Metal Nanocomposites

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Carbon nanotubes (CNTs) have great potential for use in composite materials, because of their unique and excellent electrical, thermal and mechanical properties. They are highly rigid with a Young's modulus of about 1 TPa and strength of about 30 GPa, yet they can be reversibly bent and can also undergo plastic deformation. Indeed, it is proposed that owing to their remarkable mechanical peroperties, the CNTs could advantageously substituted for carbon fibers as reinforcing elements in composites. Other important particularities of CNTs are their large aspect ratio and their metallic characteristic. Thus, the addition of CNTs to ceramic matrix allows the fabrication of ceramic composites with not only enhanced mechanical properties but also electrical conductivity.

However, it is difficult to prepare the CNTs dispersed ceramic composites via conventional powder processing such as milling/mixing, because of poor dispersion due to large difference in density between ceramic and CNT, adhesion property, etc. In our research group, therefore, to obtain the Al_2O_3 composites with homogeneous dispersion of CNTs, a catalytic route for the *in-situ* formation of CNTs on nano-sized Fe dispersed Al_2O_3 powders was applied. The experimental results show that the composite powder with required size and dispersion of CNTs can be realized by control of synthesis condition [1].

In this presentation, we demonstrate the densification of CNTs dispersed Al_2O_3 powders and its microstructural characteristics. Dense Al_2O_3 nanocomposites with homogeneous dispersion of Fe particles and CNTs have been fabricated by high-frequency induction heating method under an applied stress. The microstructural characteristics of sintered composites such as density, phase composition and distribution of carbon nanotubes in the Al_2O_3 matrix were invesitigated. In addition, the electrical resistivity of the composites were measured at room temperature and analysed based on the observed microstructural characteristics.

[1] H.-J. Joun, Y.H. Choa, S.-T. Oh and S.-G. Kang, "Powder Synthesis and Characterization for CNTs/Metal/Al_2O_3 Nanocomposites by Thermal CVD", in the Conference of KPMI, October 2003.

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