

초청강연 III

THE SCIENCE AND TECHNOLOGY OF MECHANICAL ALLOYING

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Abstract

Mechanical alloying (MA) is a powder metallurgy processing technique involving cold welding, fracturing, and rewelding of powder particles in a high-energy ball mill. This has now become an established commercial technique in producing oxide dispersion strengthened (ODS) nickel- and iron-based materials. The technique of MA is also capable of synthesizing non-equilibrium phases such as supersaturated solid solutions, metastable crystalline and quasicrystalline intermetallic phases, nanostructures, and amorphous alloys. In this respect, the capabilities of MA are similar to those of another important non-equilibrium processing technique, viz., rapid quenching of metallic melts. However, the science of MA is being investigated only during the past ten years or so. The technique of mechanochemistry, on the other hand, has had a long history and the materials produced this way have found a number of technological applications, e.g., in areas such as hydrogen storage materials, heaters, gas absorbers, fertilizers, catalysts, cosmetics, and waste management.

The present talk will concentrate on the basic mechanisms of formation of non-equilibrium phases by the technique of MA and these aspects will be compared with those of rapid quenching of metallic melts. Additionally, the variety of technological applications of mechanically alloyed products will be highlighted.