

## Formation of nanocrystalline Fe<sub>50</sub>Co<sub>50</sub> powders by mechanical alloying

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Fe<sub>50</sub>Co<sub>50</sub> nanocrystals were prepared by mechanical alloying in air, used Fe and Co powders (3N). The variations of crystal structure, morphology, and magnetic property were investigated as a function of milling time (in the range between 0.5 and 32 h) by using an X-ray diffractometer, field-emission scanning electron microscopy, and vibrating sample magnetometer. The complete formation of bcc Fe<sub>50</sub>Co<sub>50</sub> solid solution was observed after 10 h of alloying in dependence on the milling conditions. At this time, the alloy powders with average crystallite size of about 8 nm and a maximum saturation magnetization of 200 emu/g were obtained. For longer milling times, both the crystallite size and the magnetization decreased, while the coercive increased rapidly. The saturation magnetization of as-milled powders remained almost unchanged for a long time of their keeping in air, which suggests a due to a formation of thin oxide layer on the particles.

**Keywords:** FeCo nanoparticles, Mechanical alloying, Magnetic properties