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Synthesis of Nano-sized Permalloy Powder by Wire Explosion Method

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Nano-sized materials have been widely investigated nowadays due to their excellent enhanced physical and chemical properties. Much attention is concentrated on the synthesis technique to reduce the grain size as small as possible to get better properties in comparison with traditional methods. Various techniques for the preparation of nanoparticles have been developed such as mechanical milling, sol-gel, hydrothermal, chemical vapor deposition, wire explosion method etc.

Permalloy is an important soft magnetic material in industry due to good magnetic properties such as low coercive force and high permeability [1, 2]. In recent years, authors have attempted to find a new method for synthesis nanostructured permalloy material: electrodepostition [3], mechanochemical process [4], powder processing [5].

In this study, nano-sized permalloy powder was prepared by wire explosion method in deionized water. Phase characterization of the synthesized powders was performed using X-ray diffraction (XRD). The morphology of the prepared powders was observed by field emission- scanning electron microscopy (FE-SEM) and the compositions of the particles was determined using energy-dispersive X-ray spectroscopy (EDS). The size of powders was estimated from transmission electron microscopy (TEM) and FE-SEM. It is shown that the grains have round shape with average particle size of several tens nm. The particle size depends on the applied voltages and the diameter of raw wires.

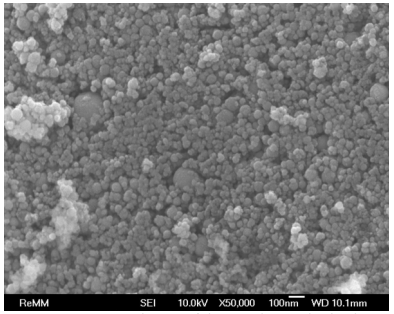

Fig. 1. FE-SEM image of the powder synthesized.

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