Preparation and Experimental Study of Properties of Magnetic Soft Composite Materials

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Abstract. Soft magnetic materials (SMMs) are widely used in many industries, for example, in conventional transformers (where electric steel is used) as well as cosmology or medicine [1-2]. The elements such Fe, Ni, Co and their alloys can be included into SMMs. Permalloy (Fe-Ni), Supermalloy (Fe-Ni-Mo) and their modifications are widely known [3]. Depending on the way of their preparation they can be divided into two main groups: soft magnetic compacts or soft magnetic composites. Soft magnetic compacts are made by compacting ferromagnetic powder without adding any insulation, so it is conventional soft magnetic material but in the desired shape. Soft magnetic composite materials are progressive materials which are made from ferromagnetic insulated and compacted powder. The aim of this work was the investigation of the possibility for optimalization of magnetic properties of the powdered compacts. Mechanical milling leads to the decrease of powder size elements and on the other hand introduces structural defects of the material strongly negative affected magnetic properties of the compacts. One of the important aspects is determination of optimum conditions for mechanical milling, as ball to powder ratio (BPR) and milling time. By investigation of three samples of pure iron powder particles prepared by different ball to powder ratio has been detected that the most suitable magnetic properties exhibit the sample milled for BPR 9:1.