Advances on Soft Magnetic Ferrites

V. Zaspalis[1,2], V. Tsakaloudi[1], G. Kogias[1], P. van der Valk[2]

Center for Research and Technology-Hellas, 56001 Thessaloniki, Greece
Ferroxcube International, Eindhoven, the Netherlands

Although several decades have passed since their first introduction as magnetic materials in technological applications, soft ferrites are still being extensively used as components in a wide spectrum of electric and electronic applications. Research and development was mainly focused on property improvement through lattice or grain boundary structure and chemistry control, by means of doping element additions. Significant property improvements have been achieved although the fundamental understanding was not always solid.

Current and future trends in MnZn- and NiZn- ferrite material development require:

i) materials with even lower power losses in order to meet component miniaturization demands
ii) enhanced frequency stability to meet among others radio frequency wireless identification demands
iii) linear low field-flux relations to meet accurate data-voice separation demands as required in broadband modem applications
iv) well controlled and preferably stable temperature characteristics to meet demands of temperature independent performance

Having specified the crystal chemistry, in all previous applications, as it will be outlined in this presentation, the good performance of the polycrystalline system passes through understanding of the nanoscale characteristics of the grain boundaries and their formation mechanism during the firing process.

Isotropic ferroxplana materials for high frequency (e.g. 900 MHz) wireless tagging applications or for very high frequency (e.g. 90 GHz) non-reciprocal switches for space communication are gradually attracting more and more interest. Case studies of targeted material developments for 900MHz and 94 GHz will be presented.

On the other hand, besides new material developments the worldwide ferrite industry has to face another serious problem, namely the relatively high production cost. Innovations along this direction are being continuously sought. These include research towards understanding the role of raw material impact on the ferrite performance, shortening the firing schedules, lowering the firing temperatures or decreasing the compaction forces. Although directly related to applied industrial needs, a great deal of fundamental knowledge is required before designing an economic ferrite production process.

In this presentation the progress in ferrite material and process development along the previously mentioned directions will be outlined.

Corresponding author e-mail: zaspalis@cperi.certh.gr