

Tailored soft-magnetic properties in Fe-based amorphous alloy by nucleation and growth controlled annealing

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NANOMET [1] exhibits high B_s of exceeding 1.8 T and low H_c of less than 10 A/m. These good soft magnetic properties are optimized by grain-size controlled annealing. Sharma has already pointed out that many nuclei formation and growth suppression by rapid heating is effective to obtain a fine grain structure, leading to extra low H_c [2]. In general, nano-crystallization of amorphous alloy by annealing can be comprehensible on the framework of classical nucleation theory. In this paper, we intend to figure out the overall feature of nano-crystallization in Fe-based amorphous alloy by use of TEM image analysis. As a result, it was clarified that the as-quenched amorphous alloy contained 10^{22} /m³ orders of magnitude pre-existing nuclei and growth of these nuclei causes coarse grain structure by annealing at low heating rate. Furthermore, processable annealing for user will be quantitatively discussed.

References:

[1] A. Makino, IEEE Trans. Magn., 48 (2012) 1331.

[2] P. Sharma, X. Zhang, Y. Zhang and A. Makno, IEEE Trans. Magn., to be published.