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High Rate and Low Temperature Sputter-Deposition of Ni-Zn Ferrite Thin Films

T. Ogita, S. Yamamoto, G. Isida, H. Kurisu, M. Matsuura and Y. Shimosato[1]
Faculty of Engineering, Yamaguchi University, Japan,
z016fg@yamaguchi-u.ac.jp, [1]Shimadzu Corporation, Japan.

A novel preparation method of a Ni-Zn ferrite thin-films for high frequency magnetic devices has been developed. Introduction of reactive sputtering utilizing a dense and active electron-cyclotron-resonance (ECR) microwave plasma enabled us low-temperature and high rate deposition using metal sputtering targets. At first, three 100 mm square plate targets were equipped in the vicinity of the plasma extraction window in the ECR sputtering apparatus. Ni-Zn ferrite thin-films with saturation magnetization of 224 emu/cc and relatively low coercivity of 15 Oe were successfully obtained at 200 degrees C and deposition rate of 14 nm/min. To increase the deposition rate, a corn type target whose area is 2.5 times larger than the total area of the three plate targets was used. Maximum deposition rate of 42.5 nm/min and the film thickness uniformity of within pulse minus 7 % were obtained inside the radius of 40 mm. In conclusion, reactive ECR sputtering is one of the most promising deposition methods of ferrite thin-films.