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Comparative Study of the Magnetic Properties of Ba-Ferrite Thin Films Deposited on Different Substrates[1] W. J. YEH, JOEL KREHBIEL, A. R. ABUZIR, Department of Physics, University of Idaho — The Barium ferrite ($BaFe_{12}O_{19}$) film is an attractive candidate for the self-biased microwave circulator application. The requirement for this application is that the Barium ferrite films have excellent c-axis orientation with moderate H_c value and good squareness, so that Barium ferrite films can be self-biased to eliminate the requirement of the external DC magnetic field. We have used the magnetron sputtering to deposit Ba-ferrite films onto silicon, MgO and sapphire substrates. All of the films were deposited in the same Ar + O_2 atmosphere at elevated substrate temperatures to optimize the magnetic properties in terms of c-axis orientation. The films were studied by VSM, XRD, SEM and MOKE. It was found that Barium ferrite thin films on silicon substrates had coercivity value of 3000 Oe with squareness of 0.6 with moderate c-axis orientation. Films deposited on MgO showed better c-axis orientation. However, the values of H_c and squareness were low. Films deposited on sapphire showed the best c-axis orientation. The coercivity value of 3000 Oe and the squareness of 0.93 in perpendicular direction were achieved. Based on our results sapphire is the promising substrate choice for growing Barium ferrite films for the self- biased circulator application.

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