Modeling of Electromagnetic Behavior of CompositeThin Layers using Genetic Algorithm

Abdelmalek REDDAF, Karim FERROUDJI, Mounir BOUDJERDA, Khaled Hamdi Chérif, Isslam Bouchachi, fatima Djerfaf

Abstract : In this paper, we present a new model using the highfrequency electromagnetic simulator for several binary mixtureswhere the load is in the lossless thin film form with a permittivityof (? = 100, 200, 300, and 400) and for various thickness values ina range of 10 µm to 250 µm with respect to the host matrix. Themodel operates in a variety of frequencies from 8.2 GHz to 12.4GHz. The effective permittivity of composites is evaluated usingNicholson Ross Weir (NRW) algorithm in a rectangularwaveguide. The implementation of NRW algorithm is conductedon various samples simulated by HFSS, in order to estimate thedielectric composite behavior. Furthermore, we employ a geneticalgorithm methodology (GA) for the filling factor optimization ofthe proposed model by Mosallaei. The obtained results show agood agreement with the theoretical models, which ensure thevalidity of our proposed model for characterizing theelectromagnetic behaviour of dielectric thin films.

Keywords : Thin films, electromagnetic behaviour, dielectric mixtures, Genetic optimization, mico wave.