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Magneto-Dielectric Composite Material With Low Values of Permittivity and Permeability for Antenna

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Recently, various technologies were investigated for miniaturization of antenna but investigations of miniaturization were limited about rise of permittivity of base frame material [1]. High permittivity was useful to miniaturization of antenna but induced decrease of antenna bandwidth. This problem is able to overcome with inclusion of permeability but too high permittivity and permeability is not useful for antenna of efficiency. Thus permittivity and permeability need to do smaller (permittivity x permeability < 5). In addition, It must have low loss [2]. We studied through composite of Ni-Zn spinel ferrite and silicon elastomer with various fomula. The object was low permittivity, permeability and loss in this study. Complex permittivity (real part is Er' and imaginary part is Er'') and permeability (real part is Mr' and imaginary part is Mr'') of composite material are shown in Fig. 1. Permittivity and permeability, loss tangente and loss tangent, of Ni-Zn spinel ferrite were 7.04, 8.07, 0.01 and 0.033 at 100 MHz. Especially, the Imaginary part of permeability of Ni-Zn spinel ferrite was increased nearly exponentially from 100 MHz. This powder was composited with Silicon elastomer. These properties of composite material were decreased with decrease of containing percent of Ni-Zn spinel ferrite. Permittivity (≈ 3.52) and permeability (≈ 1.33) of 20 wt% sample was shown lower loss tangent (0.003 and 0.005) at 100 MHz. Change of these properties were induced from low loss, permittivity and permeability of silicon. This material was shown more useful than dielectric material in simulation result of antenna (not illustated in this abstract). This result means that magneto-dielectric composite material is more useful for antenna.

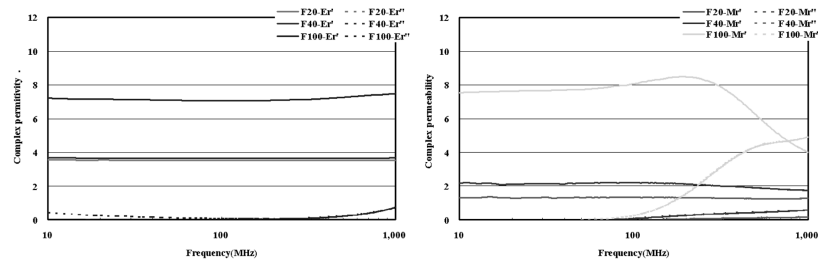


Fig. 1. Complex permittivity and permeability of the composite material (Silicon and Ni-Zn) with different containing percent (ferrite 20, 40 and 100 wt%).

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