

Development of low loss Ni-Zn ferrite for X band Circulator

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Objective

•The aim of this proposal is to develop low loss Ni-Zn ferrite circulator functioning with high frequency regime. The choice of this material is justified by the fact that, it has high permittivity, low loss, high saturation magnetization, excellent dielectric properties and anisotropic properties. Circulators are the most important microwave device based on non-reciprocity of ferrites. The circulation of electromagnetic field results in transmission with low losses in one direction and isolation in an opposite direction. The signal can be guided from the emitter to the antenna and from the antenna to the receiver in one single device. Presence of the ferrite inside the waveguide junction would result in circulation when it is magnetized. The basic required material properties for circulators are low insertion loss, low linewidth, high permittivity and high temperature stable magnetization, etc. Ni-Zn ferrite can be a better substitute in place of commercially used barium ferrite as it exhibit low linewidth ($\sim 2000\text{Oe}$ in X- band), high permittivity (~ 60 in X- band) and low loss (10^{-2}). Optimization of processing conditions for Ni-Zn ferrite in bulk form.

Highlights

- Characterization of the processed bulk and studying its physical properties (structural and microstructural), Magnetic response (Saturation magnetization, linewidth), temperature and frequency dependent permeability and permittivity response at high frequency regime.
- Identification of the composition that exhibits the best magnetic, physical and permeability and permittivity response.
- Preparation of circulator of required dimension

The successful completion of this project would help to develop circulators indigenously.

Deliverables: A bulk (disc of required dimension) of ferrite circulator

