A review of Structural and magnetic properties of prasodymium substituted LiCo ferrites

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Abstract:

Praseodymium substituted nano crystalline LiCo spinel ferrites with different concentrations were fabricated by micro-emulsion route. XRD confirmed the formation of the single phase spinel ferrites with minor coexistence of orthophase in this type of ferrites. The particle size from XRD data was calculated in range from 53 nm to 106 nm for LiCoPr ferrite. The VSM was employed for magnetic studies between−10,000 Oe and 10,000 Oe range. Considerable high value of 'Hc' coercivity (1581 Oe) and an enhanced value of 'Ms' saturation magnetization (51 emu/g) have been obtained as result of substitution of Pr in LiCo ferrites. These ferrites have considerable values of Hc.

Introduction:

The electronics of devices operating at microwave frequencies is moving forward from mm range up to GHz range. The penetration of electromagnetic waves requires nonconducting nanomaterials with small coercive force, large retentivity, rectangle hysteresis loop and soft magnetic nature. The microwave devices include isolators, circulators, phase shifters, power limiters etc.

Table1: Magnetic measurements of some Lithium based ferrites

Samples	Remanence (M_r) emu/g	Coercivity (H_c) Oe	Saturation Magnetization (M_s) emu/g
$Li_{0.4}Zn_{0.2}Fe_{2.4}O_4$	19.6	155	80
$Li_{0.2}Ni_{0.8}Fe_2O_4$	10.5	120	54
$Li_{0.2}Co_{0.5}Mn_{0.3}Fe_2O_4$	14.65	196.45	56.42
$Li_{0.3}Co_{0.5}Zn_{0.2}Fe_2O_4$	8.29	97.8	70.24
$LiCo_{0.5}Pr_{0.035}Fe_{1.965}O_4$	20.7	131	47.4

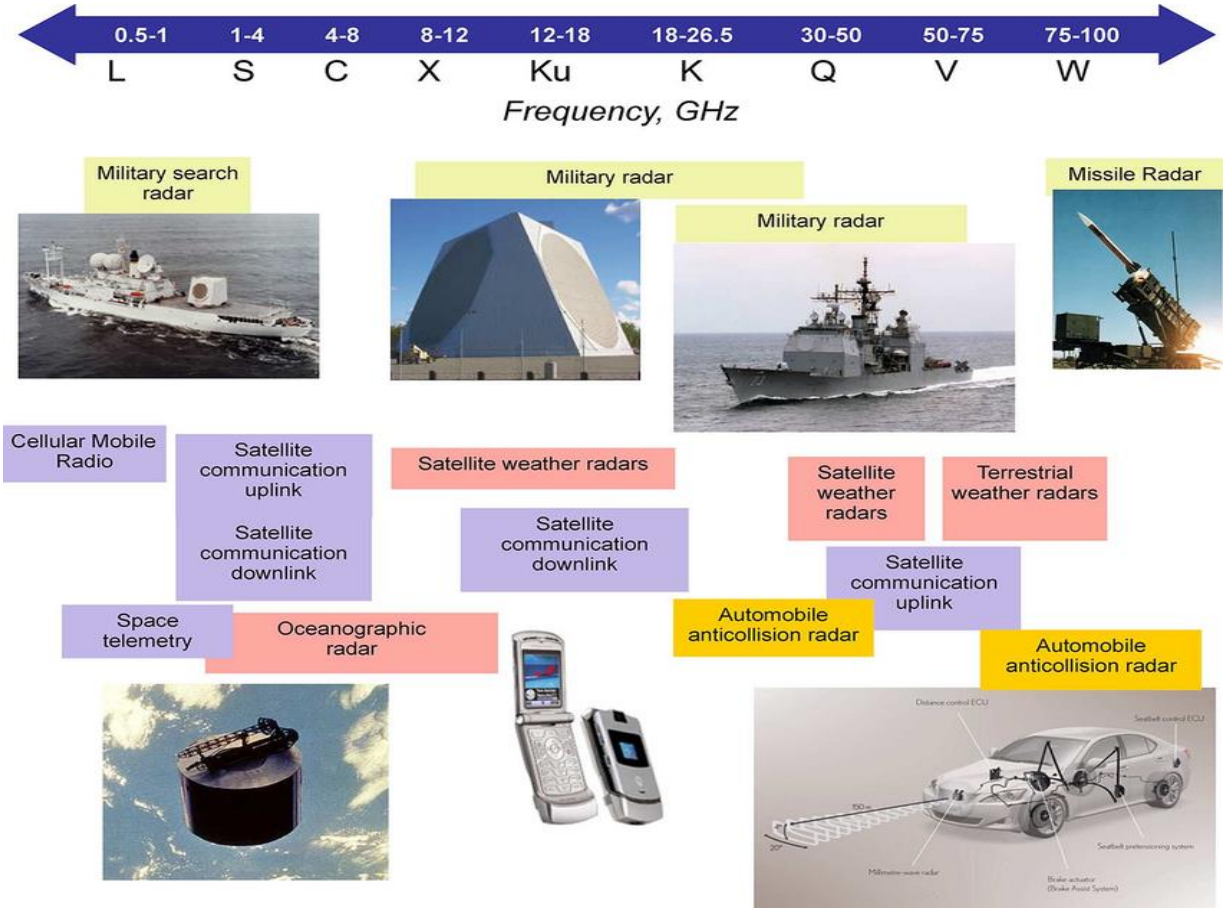

Figure1: Communication in high frequency range

Dielectric Measurement of Li Based Ferrite with Frequency

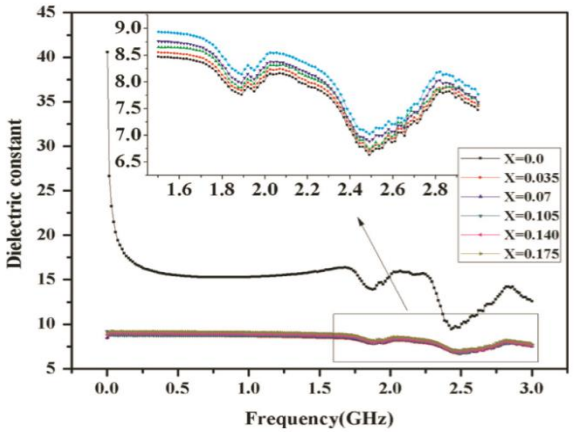

Fig. 4. Effect of frequency on the dielectric constant (real part) of "$LiNi_{0.5}Nd_xFe_{2-x}O_4$" spinel ferrite.

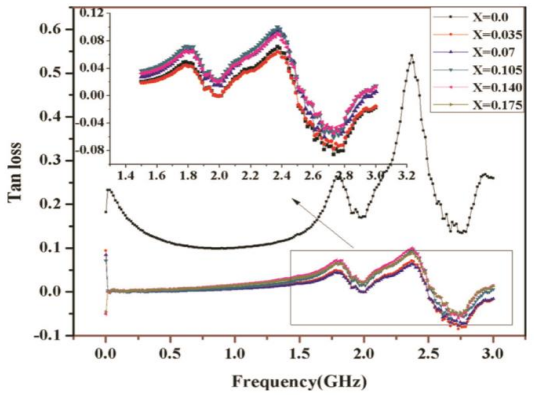

Fig. 6. Effect of frequency on the dielectric loss of "$LiNi_{0.5}Nd_xFe_{2-x}O_4$" spinel ferrite.

Conclusions:

Li based ferrites are frequently used microwave spinels for certain distinguishing qualities; Having low cost, High curie temperature, Large saturation, magnetization, Small Coercivity, For better device performance, dielectric loss should also be low

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