Abstracts

Magnetic Materials for Millimeter Wave Applications

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Magnetic materials of interest at millimeter wavelengths can be grouped under four headings: 1) conventional polycrystalline ferrites with cubic crystal structure, 2) yttrium iron garnet and similar single crystals, 3) ferrites having hexagonal crystal structures, and 4) antiferromagnetic materials. The conventional polycrystalline ferrites have been used in constructing millimeter wave phase shifters, circulators, and Faraday rotation isolators. Yttrium iron garnet single crystals are distinguished by their extremely small damping and resultant narrow ferromagnetic resonance absorption line, of tie order of 0.3 oersted at X-band frequencies. The small damping of the processing magnetization makes this material useful as a relatively high V, tunable, resonant circuit with Q's of the order of 3000. Magnetic materials with hexagonal crystal structure whose preferred direction of magnetization lies along the C axis are said to be uniaxial, and their effective internal anisotropy fields range from virtually zero to greater than 30,000 oersteds. The uniaxial materials are useful in compact, light weight resonance load isolators, harmonic suppressors, etc., in any application where their large effective internal field can be used to advantage. The antiferromagnetic materials have extremely large effective internal fields and can be used in resonance devices in the frequency range from 2 millimeters into the submillimeter region.

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