

1.2.5. METAMATERIALS – A CHALLENGE FOR ELECTROMAGNETIC NONDESTRUCTIVE EVALUATION

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It has been known for a long time that electrical properties of a host material can be changed by the periodic inclusion (the period being small relatively to the wavelength) of small, variously shaped pieces of metal. The subject has been known as artificial dielectrics, composite materials, or microstructured materials. The aim has always been to reproduce physical response of known materials or to realize some desirable responses not readily available in nature.

The materials with simultaneously negative permittivity and permeability can be regarded as negative refractive index materials which in a limited frequency band may exhibit, e.g., negative refraction. The currently used term, metamaterials, is particularly applied to the cases when the inclusions lead to radical changes in the values of permeability and/or permittivity. It has shown that a slab of material having a value of -1 both for relative permeability and the permittivity may perfectly reconstruct a subwavelength image. This metamaterial would serve as perfect lens.

This lens could be used also as flux concentrator.

In this paper are presented the theoretical and experimental results for obtaining images in near field and the concentration of flux using the phenomenon of spatial resolution. The calculus and the experiments are made for metamaterials with Swiss Rolls, being obtained a good correlation.

This phenomenon can lead to a special development of nondestructive evaluations by electromagnetic procedures.

Acknowledgments

This paper is partially supported by the Romanian Ministry of Education, Research and Innovation under Nucleus Program – 09 43 01 04 and National Plan II – Contract no. 71-016/2007-MODIS.