

APPLICATION OF CHIRAL LAYERS AND METAMATERIALS FOR THE REDUCTION OF RADAR CROSS SECTION

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Abstract—In this paper, the applications of chiral layers and metamaterials as radar absorbing materials are investigated. A perfect electric conductor plate covered by a chiral metamaterial is considered and after the formulation of the problem, reflection of the structure under an oblique plane wave incidence of arbitrary polarization is investigated. Then several examples of the applications of chiral layers in nondispersive, dispersive, and chiral nihility conditions are provided to design of zero reflection coatings. Finally, application of chiral metamaterial structures as microwave absorbers is discussed. In some of the provided examples, the method of genetic algorithm is used to optimize chiral coatings for the minimization of co- and cross reflected power.

1. INTRODUCTION

The study of interaction of electromagnetic fields with chiral media is a recognized subject of modern electromagnetics dating back to the last decades. Unlike the ordinary materials, described by electric permittivity and magnetic permeability, chiral media include a magneto-electric coupling yielding to interesting properties such as optical activity, circular dichroism, and polarization transformation. Basically, chirality is defined as the property of a structure of being non-superimposable onto its mirror image [1]. Recently, there is rapid development on the study of electromagnetic wave propagation in chiral media [1–8]. The possibility of realizing negative refraction by chiral nihility was first discussed by Tretyakov et al. (2003) [9].

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