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Three-dimensional electromagnetic band-gap structure containing TiO_2 fabricated by rapid-prototyping

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Abstract Three-dimensional (3D) diamond structure electromagnetic band-gap (EBG) structures containing TiO_2 fabricated by rapid-prototyping (RP) technique were investigated. The simulations based on finite element method (FEM) were employed to model the band structures. The influence of aspect ratio on the band gap width was studied. The optimal band gap width EBGs were fabricated and investigated experimentally. Gel-casting together with RP technique were used in the fabrication. TiO_2 gel was cast into the diamond structure molds fabricated by RP method to obtain the green EBG structures. The transmission characteristics of the EBG structures were measured by transmission/reflection (T/R) methods using a vector network analyzer. Complete band-gap was observed in the transmission characteristics in the frequency from 11 GHz to 12 GHz, which agreed well with the simulation results.

Keywords Electromagnetic band-gap · Finite element method · Rapidprototyping · Gel casting · TiO_2

1 Introduction

Many researches have been done on artificial electromagnetic materials such as photonic crystals (Ishizaki and Noda 2009; Takahashi et al. 2009) electromagnetic band-gap (EBG) structures (Schuster and Klein 2003; Khromova et al. 2009) and double negative (DNG) materials (Shelby et al. 2002) in the last few years. Photonic crystals and EBGs are sometimes

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