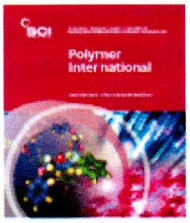

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Research Article

Thermal and electrical behaviour of some hybrid polyimide films containing barium and titanium oxides

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KEYWORDS

polyimides • thin films • composites • thermal stability • dielectric properties

ABSTRACT

Aromatic polyimides are high-performance polymers used in applications demanding service at enhanced temperature while maintaining their structural integrity and excellent combination of chemical, physical and mechanical properties. The incorporation of various metallic additives into a polyimide matrix improves its properties, leading to materials required by specific applications. Hybrid polyimide films containing barium and titanium oxides having thicknesses in the range of tens of micrometres were prepared. These films were obtained using the sol-gel technique starting from a poly(amic acid) and a soluble precursor of metal oxides. They exhibited good thermal stability having an initial decomposition temperature above 460 °C, and a glass transition temperature in the range 217-238 °C. Two subglass transitions, γ and β, were evident from dynamic mechanical analysis and dielectric spectroscopy. A study of the thermal and electrical behaviour of some hybrid polyimide films containing barium and titanium oxides is presented. On increasing the concentration of metal oxides, an increase of dielectric constant and a decrease of thermal stability of the hybrid films were observed. The presence of metal oxides shifted the glass transition temperature and the temperature of the β transition to higher values. Copyright

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Electromagnetic characterization of chiral auxetic metamaterials for EMC applications

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Abstract

A new class of auxetic materials, a hexachiral honeycomb structure with good mechanical properties, is investigated through computer simulation and measurement. The electromagnetic properties for shielding applications are taken into account. This new material shows some interesting EMC properties (e.g. − 40 dB transmittance at 2.4 GHz) and promises better performance using different insertion techniques.

Keywords: Metamaterials; Chiral; Honeycomb; Microwave absorption

Article Outline

1. Introduction

In the past years, an increasing amount of effort has been invested in the development of new materials, with good mechanical properties, low weight and low cost. In particular auxetic materials benefit from their negative Poisson's ratio [1] and are investigated closely in the last decade [2], [3] and [4]. In the same time, we witness an increase in the electromagnetic pollution of the spectrum especially in the free bands (2.4 GHz). Coding techniques have been developed to ensure the "peaceful" coexistence of multiple emitter/receiver pairs in the same frequency band. In some cases, these techniques are not sufficient, especially when good shielding for an enclosure is imperative (aeronautics [5], medicine etc.). A natural step forward is to investigate the electromagnetic properties of these materials, in order to provide good electromagnetic shielding.