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Letter

Terahertz shielding properties of aero-GaN

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Abstract

The electrodynamic properties of the first aero-material based on compound semiconductor, namely of Aero-GaN, in the terahertz frequency region are experimentally investigated. Spectra of complex dielectric permittivity, refractive index, surface impedance are measured at frequencies 4–100 cm^{-1} and in the temperature interval 4–300 K. The shielding properties are found based on experimental data. The aero-material shows excellent shielding effectiveness in the frequency range from 0.1 to 1.3 THz, exceeding 40 dB in a huge frequency bandwidth, which is of high interest for industrial applications. These results place the aero-GaN among the best THz shielding materials known today.

Keywords: aero-GaN, complex dielectric permittivity, THz shielding

(Some figures may appear in colour only in the online journal)

1. Introduction

Terahertz (THz) radiation, ranging from 100 GHz up to 30 THz, is perceived as an electromagnetic spectrum region with rather weak radiation sources. This statement illustrates the narrow perception of this spectral region, originating from the lack of miniaturized semiconductor sources able to generate tunable and medium- or high-level electromagnetic power, as in microwaves and millimeter wave regions. However, there are strong THz radiation sources such as far-infrared lasers, gyrotrons, backward-wave oscillators (BWOs) [1, 2], free-electron lasers or synchrotrons. Even the miniaturized semiconductor THz sources show nowadays rather large THz emitted powers. For example, an array of 89 resonant-tunneling diodes integrated with dipole antennas generates 0.73 mW at 1 THz [3]; the BWOs provide coherent and continuously tunable radiation in the range between

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