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Exploitation of Ultra-porous Aerogalnite for Microwave Electromagnetic Interference Shielding

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In this paper, we present the electromagnetic interference shielding properties of an ultra-porous and ultra-light GaN-based nanomaterial, which we will refer to with aero-GaN. The importance of the so-called X-band (8.2-12.4 GHz) for radio communications has pushed researchers to investigate new shielding materials, based on carbon nanotubes (CNTs) and their composites, 2D atomically thin nanomaterials (e.g. MXenes and MoS_2) and nitride nanocomposites. We propose here a new ultra-porous semiconductor nanomaterial formed by hollow GaN micro-tetrapods (with nm-scale wall thickness) obtained by direct growth using hydride vapour phase epitaxy of GaN on a sacrificial network of ZnO microtetrapods. Using a 2-mm thick aero-GaN sample, we have obtained a specific shielding effectiveness SSE=SE/ρ=185 dBcm^3/g (where ρ is the density in g/cm^3), which is comparable with many state-of-the-art carbon composites and metal-based foams/fibers/filaments embedded in polymer matrixes. With an overall area of just 288 mm^2, the proposed sample could be profitably used to shield a whole monolithic microwave integrated circuit (MMIC), for example a T/R module for space borne radar in X-band.