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We investigate the electromagnetic shielding properties of an ultra-porous lightweight nanomaterial named aerogalnite (aero-GaN). Aero-GaN is made up of randomly arranged hollow GaN microtetrapods, which are obtained by direct growth using hydride vapor phase epitaxy of GaN on the sacrificial network of ZnO microtetrapods. A 2 mm thick aero-GaN sample exhibits electromagnetic shielding properties in the X-band similar to solid structures based on metal foams or carbon nanomaterials. Aero-GaN has a weight four to five orders of magnitude lower than the weight of metals.