469. Title:Sierpinski fractal plasmonic nanoantennas
Authors:Rosa, Lorenzo (1); Sun, Kai (2); Juodkazis, Saulius (1)
Source title:Physica Status Solidi - Rapid Research Letters
Volume:5
Issue:5-6
Issue date:June 2011
Publication year:2011
Pages:175-177
Language:English
Document type:Journal article (JA)
Abstract:We propose plasmonic Sierpin´ski gasket, a self-replicating fractal, with structural elements spanning from ∼100 nm to ∼5 μm made by standard electron beam lithography (EBL), metal deposition, and lift-off sequence. Such structures demonstrate light field enhancement from visible to far-IR spectral range and can be scaled up towards THz band. Numerical simulations show that as the fractal order is increased, the optical extinction band broadens from the visible light towards far-IR, achieving a light field enhancement of more than four orders of magnitude in the nano-gap proximity. Such antennas are prospective for IR-THz filter, detection, and emission applications. Fundamental mode simulation of Sierpin´ski fourth-order fractal gold nanoantenna with 10 nm nano-gap, made by EBL and lift-off. (© 2011 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim) Novel types of fractal Sierpinski plasmonic antennas have been fabricated and their optical properties modeled over the visible-to-THz spectral range. The authors report field enhancements spanning a record-broad spectral range with localized high-intensity "hot-spots" where enhancement exceeds a factor of 104. A fractal scaling of self-similar patterns is mirrored in the hot-spots area distribution and is reflected in the enhancement of spectral properties. Applications in sensing, light harvesting, and analytical chemistry are envisaged.