Scalable and Tunable Periodic Graphene Nanohole Arrays for Mid-Infrared Plasmonics - DTU Orbit (18/11/2019)

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Despite its great potential for a wide variety of devices, especially mid-infrared biosensors and photodetectors, graphene plasmonics is still confined to academic research. A major reason is the fact that, so far, expensive and low-throughput lithography techniques are needed to fabricate graphene nanostructures. Here, we report for the first time a detailed experimental study on electrostatically tunable graphene nanohole array surfaces with periods down to 100 nm, showing clear plasmonic response in the range similar to 1300-1600 cm⁻¹, which can be fabricated by a scalable nanoimprint technique. Such large area plasmonic nanostructures are suitable for industrial applications, for example, surface-enhanced infrared absorption (SEIRA) sensing, as they combine easy design, extreme field confinement, and the possibility to excite multiple plasmon modes enabling multiband sensing, a feature not readily available in nanoribbons or other localized resonant structures.

General information
Publication status: Published
Organisations: Department of Micro- and Nanotechnology, Nanocarbon, Center for Nanostructured Graphene, Barcelona Institute of Science and Technology
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Pages: 5913-5918
Publication date: 2018
Peer-reviewed: Yes

Publication information
Journal: Nano letters
Volume: 18
Issue number: 9
ISSN (Print): 1530-6984
Ratings:
BFI (2018): BFI-level 2
Scopus rating (2018): CiteScore 12.71
Web of Science (2018): Impact factor 12.279
Web of Science (2018): Indexed yes
Original language: English
Keywords: Graphene plasmonics, Plasmonic crystals, SEIRA, Large-scale nanopatterning, Nanoimprint lithography
Electronic versions:
acs.nanolett.8b02613.pdf
DOIs: 10.1021/acsnanolett.8b02613
Source: FindIt
Source ID: 2438455957
Research output: Contribution to journal › Journal article – Annual report year: 2018 › Research › peer-review