Fabrication of Split Ring Resonators (SRRs) for IR energy harvesting using multiphoton lithography

Savvas Papamakarios[1,2*], Maria Kafesaki[1], Kosmas L. Tsakmakidis [2] and Maria Farsari [1]

[1] Institute of Electronic Structure and Laser, Foundation for Research and Technology – Hellas (FORTH – IESL), 100 Nikolaou Plastira Street, 70013, Heraklion, Greece
[2] National and Kapodistrian University of Athens, Department of Physics, University Campus, 157 84, Zografou, Athens, Greece
[*]Corresponding author email: spapamakarios@iesl.forth.gr

Artificially designed materials, known as metamaterials, provide a completely new perspective to the optical world, overcoming many limitations of ordinary materials. However, fabrication of 3D optical metamaterials, which would enable the exploitation of their full potential, remains challenging due to limitations of conventional manufacturing techniques.

Multiphoton lithography (MPL) [1] enables structuring sub-wavelength features using a fs laser and suitable photoresist. In this work, we present the development of asymmetrically arranged split ring resonators (SRRs) [2], which, among others, can be used for harvesting the energy of the NIR spectrum [3]. Previous theoretical calculations have shown that the IR radiation emitted in photovoltaic devices can be harvested, which is of key interest for a wealth of applications in the crucial field of renewable energy sources. Our structures (see below) have been fabricated on silicon substrate using proper photoresist, and were further processed using electroless silver plating [4] in order to make them conductive so as to enable absorption of the incident radiation.

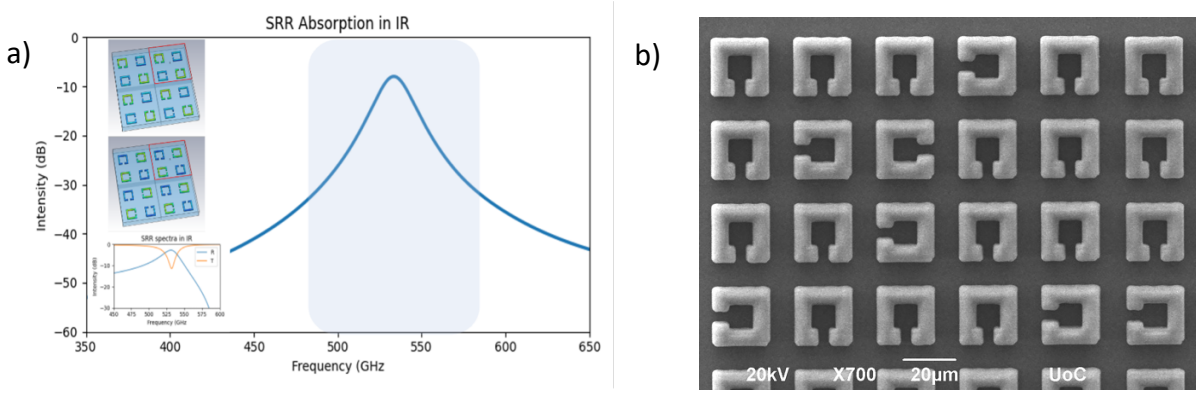

Figure 1. a) Calculated absorption spectra of the asymmetrically arranged SRR in caclulated IR window and b) SEM image of the fabricated array of SRRs.

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