Bulk photovoltaic effect in photoconductive metamaterials based on cone-shaped nanoparticles - DTU Orbit (09/11/2017)

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Photoelectric properties of metamaterials comprising asymmetrically shaped, similarly oriented metallic nanoparticles embedded in a homogeneous semiconductor matrix are theoretic
ally and numerically studied. The asymmetric shape of the nanoparticles is found to result in the existence of a prefer red direction where “hot” photoelectrons are emitted from the
nanoparticle surface under the action of the localized plasmonic resonance excited in the nanoparticles. The resulting directional photocurrent flow occurring when nanoparticles are uniformly illuminated by a homogeneous plane wave is the directanalogy of the photogalvanic effect known to exist in naturally occurring non-centrosymmetric media. This plasmonic bulk photovoltaic effect is intermediate between the inner photoelectric effect in bulk media and the outer photoelectric effect atmacroscopic interfaces. The results obtained are valuable
for characterizing photoemission and photoconductive properties of plasmonic nanostructures. They can find many uses for photodetection-related and photovoltaic applications

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