A Switchable Metasurface as Near-Perfect Absorber

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We present a simple route to create a surface with near-perfect absorbing properties that can be tuned in regard of the absorbed wavelength. The field of perfect absorption has attracted increasing attention in the last decades due to the potential applications in the fields of photovoltaics, photocatalysis and sensing. Narrow-band absorbers based on coupled plasmonic systems are of particular interest as they are simple to achieve and not limited in their scalability as compared to lithographic approaches.[1]
By preparing such absorbers via deposition of gold nanoparticles with polyaniline shells (Au-PANI) on gold mirrors, we create an inherently tunable metasurface. The nature of PANI as an electrochromic polymer results in a switchability of the plasmonic system that can be triggered by either changing pH of the surrounding or applying a voltage.[2] Both alter the refractive index in the gap region between plasmonic particle and mirror resulting in pronounced changes of the absorbed wavelengths (see Figure 1).

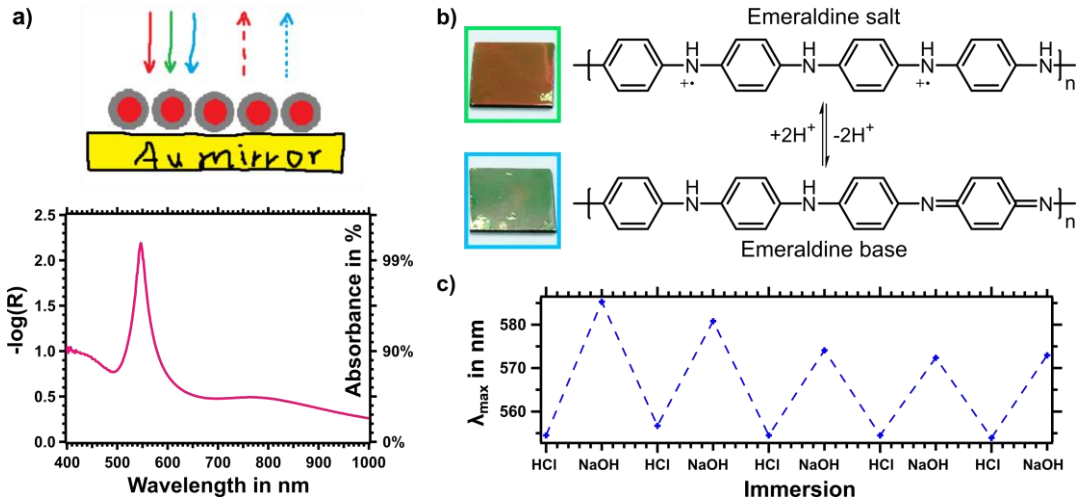

Figure 1. a) Scheme of the metasurface near-perfect absorber and its absorbance spectrum calculated from reflectance measurements at 10° incidence. b) Structural formula of the protonated form (emeraldine salt) and deprotonated form (emeraldine base) of polyaniline with respective photographs of the plasmonic metasurface. c) Maximum peak positions of the absorbance spectra after immersion in HCl or NaOH.

[1] Akselrod et al., *Adv. Mater.* **2015**, *27*, 8028–8034.
[2] Jeon et al., *Chem. Mater.* **2016**, *28*, 2868−2881.

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