SURFACE PLASMON MEDIATED SOLAR ENERGY CONVERSION IN MOLECULAR THIN FILMS

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Abstract: Surface plasmons have recently demonstrated use in improving the ability of “next generation” photovoltaic materials to convert sunlight to electricity. These reports have motivated research into the fundamental mechanism of how surface plasmons alter photocurrent generation. To this end we have deposited thin layers of molecular semiconductors on surface plasmon active nanohole films. We have used this simple thin film structure to study enhanced absorption, enhanced photocurrent, and time resolved electronic energy flow within a hybridized plasmon – molecule excitation manifold. Our results indicate that while plasmonics has the ability to improve existing energy conversion architectures, the greatest benefits may precipitate from an intertwined plasmon – PV hybrid and not plasmonic materials as a PV additive.

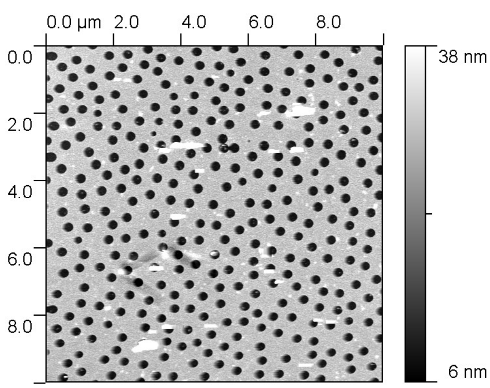

Illustration 1: Atomic force micrograph of a silver film perforated with sub-wavelength holes.

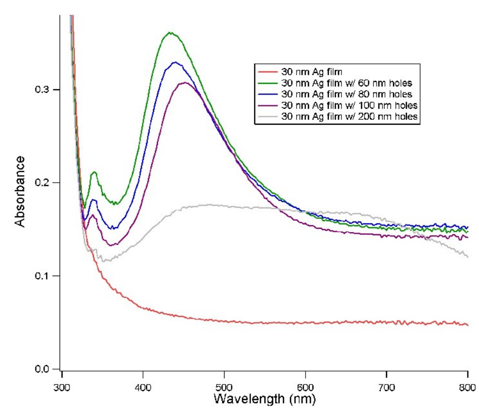

Illustration 2: Absorbance spectra of silver films perforated with varying sub-wavelength hole size.

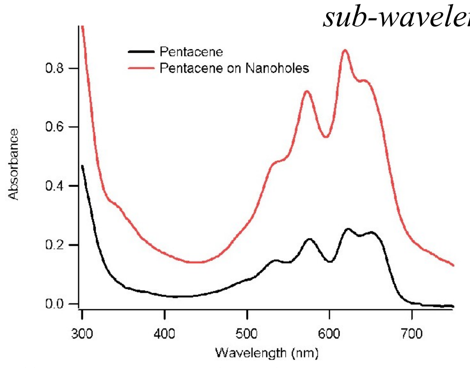

Illustration 3: Absorbance spectra of pentacene thin films on glass and plasmonic nanohole film.