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Plasmon enhanced light harvesting

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Plasmon energies can be tuned across the spectrum by simply changing the geometrical shape of a nanostructure. Plasmons can efficiently capture incident light and focus it to nanometer sized hotspots which can enhance electronic and vibrational excitations in nearby structures. Another important but still relatively unexplored property of plasmons, is that they can be efficient sources of hot energetic electrons which can transfer into nearby structures and induce a variety of processes. This process is a quantum mechanical effect: the decay of plasmon quanta into electron-hole pairs. I will discuss how plasmon induced hot electrons can be used in various applications: such as to induce chemical reactions in molecules physisorbed on a nanoparticle surface; to inject electrons directly into the conduction band of a nearby substrate; to dramatically enhance the light harvesting efficiency of a photovoltaic device; and to induce local doping of a nearby graphene sheet.