Electronic Supplementary Information

Angle-resolved plasmonic photocapacitance of gold nanorod dimers

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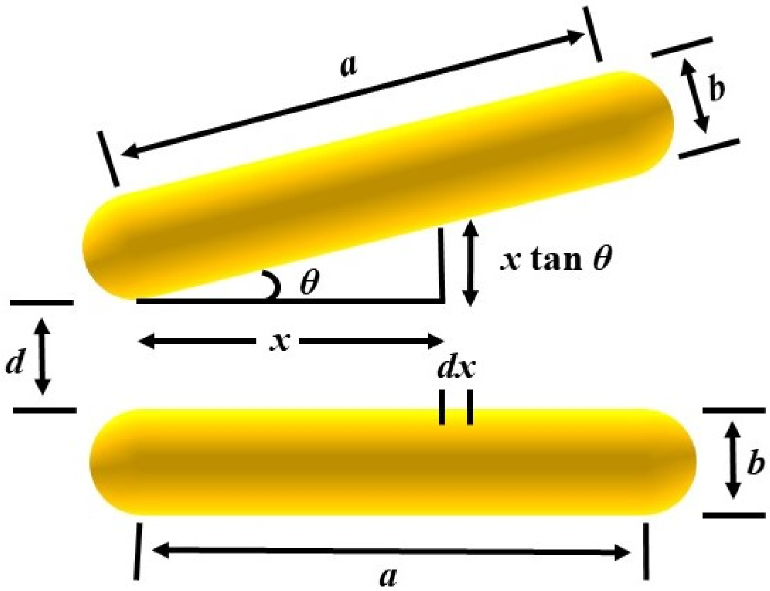
SI 1. Detailed Calculations of the Capacitance



The capacitor model for nanorod dimer consists of two contributions. First, the classical capacitance (C_C) which can be calculated considering the angle between the nanorods as parallel plates. The small capacitance (dC_C) generated due to a small increase in the length 'dx' of the plates (rods) can be given as,

$$dC_C = \frac{\varepsilon_r.\varepsilon_0.b.dx}{d + x\tan\theta}$$

The overall capacitance can be calculated by integrating dC_C from 0 to C_C when x changes from 0 to a.

$$
\begin{aligned}
C_C = \int_0^{C_C} dC_C &= \int_0^a \frac{\varepsilon_r.\varepsilon_0.b.dx}{d + x\tan\theta} \\
&= \varepsilon_r.\varepsilon_0.b\int_0^a \frac{dx}{d + x\tan\theta} \\
&= \varepsilon_r.\varepsilon_0.b\left[\frac{1}{\tan\theta}\ln(x\tan\theta + d)\right]_0^a \\
&= \varepsilon_r.\varepsilon_0.b\left[\frac{1}{\tan\theta}\{\ln(a\tan\theta + d) - \ln d\}\right] \\
&= \frac{\varepsilon_r.\varepsilon_0.b}{\tan\theta}\left[\ln(1 + \frac{a}{d}\tan\theta)\right]
\end{aligned}
$$

The second contribution is the quantum capacitance C_Q that arises due to the fact that the plates under consideration have only thousands of atoms and density of states (DoS) is finite in case of the metal electrodes (nanorods). The contribution due to quantum capacitance, C_Q is given by,

$$C_Q = \frac{\sqrt{\varepsilon_r}\varepsilon_0 A}{\gamma_{TF}}$$

where, ε_r is the dielectric constant of the material present in the electrode and γ_{TF} the Thomas Fermi screening length. The overall capacitance can be simplified into the form,

$$\frac{1}{C} = \left(\frac{2}{C_Q} + \frac{1}{C_C}\right)$$