Electric birefringence of gold nanorods: Effect of surfactant coating

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Absorbance of the AuNRs

In Figure S1, we show the absorbance spectrum of the synthesized gold particles, obtained with a 6705 UV-VIS spectrophotometer (Jenway, UK). In this curve, two peaks due to the plasmon resonance, corresponding to the two characteristic dimensions of the rods, are clearly observed. The particle concentration of 9.8 mg/L was chosen to remain within the measuring range of the commercial device, and to ensure the applicability of the Beer-Lambert law.

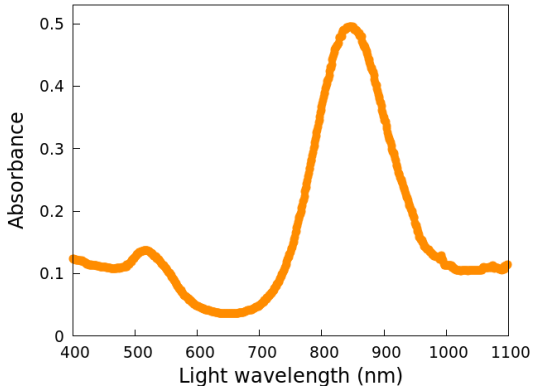

Figure S1: Absorbance spectrum of a 9.8 mg/L gold nanorod suspension.

The extinction coefficient obtained from the absorption measurements at the more intense plasmon peak, $6.6 \cdot 10^9$ L mol^{-1}cm^{-1}, is in good agreement with measured values of $4.5 - 6.5 \cdot 10^9$ L mol^{-1}cm^{-1} for rods with an effective radius of 13-15 nm,[1] similar to that of our particles.

Effect of concentration and field strength on EB

In the discussion carried our for the birefringence of gold nanorods, it has been assumed that particle interactions can be neglected. In order to check that this is a reasonable approximation, we measured the electric birefringence for samples with different concentrations. The results are shown in Figure S2, where it can be observed that the EB is proportional to the concentration, as expected for dilute systems.

Moreover, we have measured the electric birefringence as a function of the field strength.

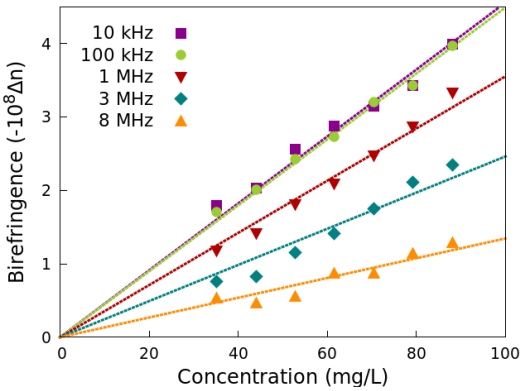

Figure S2: Electric birefringence of the AuNRs as a function of particle concentration, for different frequencies of the applied field. The points are the experimental data and the lines fittings to linear functions. The field strength is 37 V/mm, and the dispersion medium is 0.1 mM KCl.

The results, presented in Figure S3, show that Kerr's law is satisfied in the studied range. Therefore, we find ourselves far from the saturation regime, as assumed in the discussion.

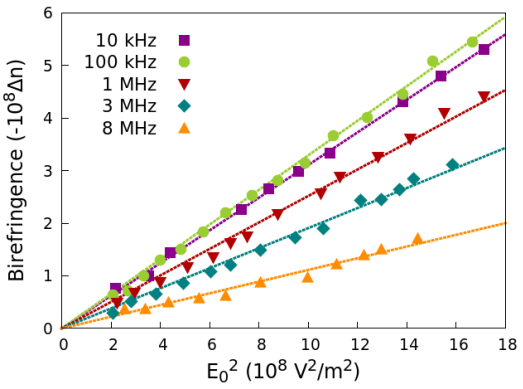

Figure S3: Electric birefringence of the AuNRs as a function of the square of the field amplitude, for different frequencies of the applied field. The points are the experimental data and the lines fittings to linear functions. The particle concentration is 88 mg/L, and the dispersion medium is 0.1 mM KCl.

References

(1) Park, K.; Biswas, S.; Kanel, S.; Nepal, D.; Vaia, R. A. Engineering the optical properties of gold nanorods: independent tuning of surface plasmon energy, extinction coefficient,

and scattering cross section. *The Journal of Physical Chemistry C* **2014**, *118(11)*, 5918–5926.