Tuning the near-infrared absorption of aromatic amines with tapered fibers sculptured gold nanoparticles

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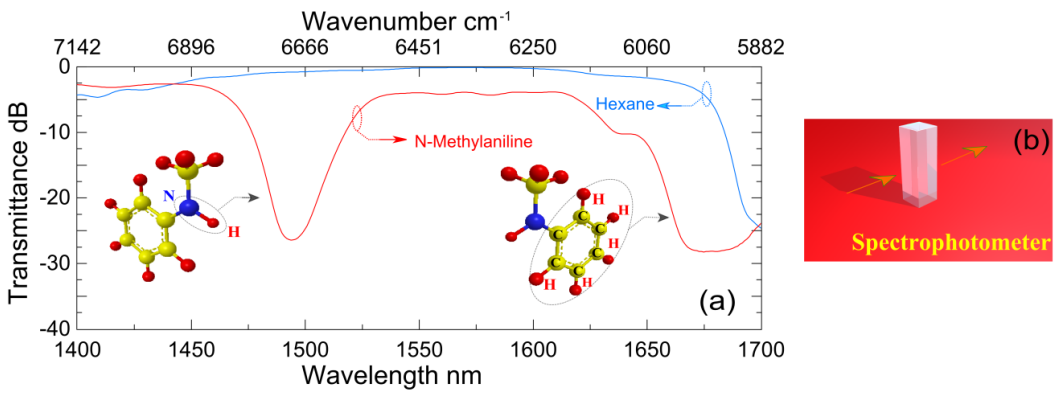

Figure S1: NIR spectrum of N-Methylanline and Hexane measured with conventional spectrophotometer. (a) Transmittance spectra of pure N-Methylaniline (NMA) and pure hexane (Hex, black curves) measured by Jasco V570 spectrophotometer recorded at room temperature of 21 ± 2°C and converted to dB units. The cuvette pathlength is 10 mm. (b) Artist's impression of the measurement at normal incidence using cuvette.

Table S1: Concentration of gold nanoparticles. N and Integrated absorption I.

D	N	$N^{1/6}$	nm × dB
20	7×10^{11}	26.67168	400
40	9×10^{10}	54.42882	480
60	2.6×10^{10}	66.9433	506
250	3.6×10^{8}	94.22866	560

D is diameter of nanoparticle in nm. N is gold nanoparticles per mL (from nanoparticles manufacturer BBInternational).

Fraction of the power in evanescent field and in the microfiber core compared to the total power guided by the fundamental mode is calculated according to Equations S1-S2 respectively:

$$\eta_{analyte} = P_{analyte}/P_{total} = \iint_{analyte} (E \times H^* dA) / \iint_{total} (E \times H^* dA) \tag{1}$$

$$\eta_{core} = P_{core}/P_{total} = \iint_{core} (E \times H^* dA) / \iint_{total} (E \times H^* dA) \tag{2}$$

Normalized electric filed colormaps are shown in Fig. S3-S5 for microfiber used in this study with $D = 2$ μm and varied nanoparticle densities and diameters of: 20 nm, 40 nm and

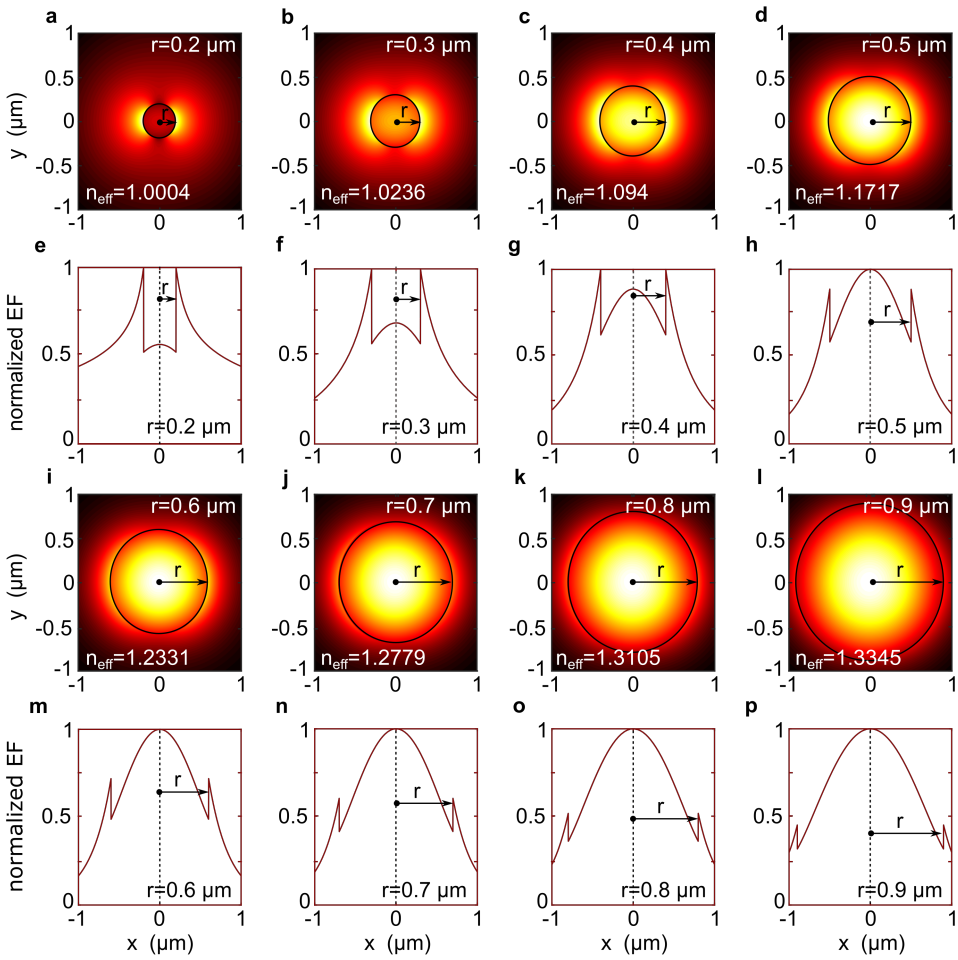

Figure S2: Numerical modelling. a-d and i-l Normalised electric field (EF) of microtapares embedded in air, according to Eq. 1, with various core radii in air, e-h and m-p cross-section at $y = 0$ μm.

60 nm respectively for incident near-infrared light of 1500 nm.

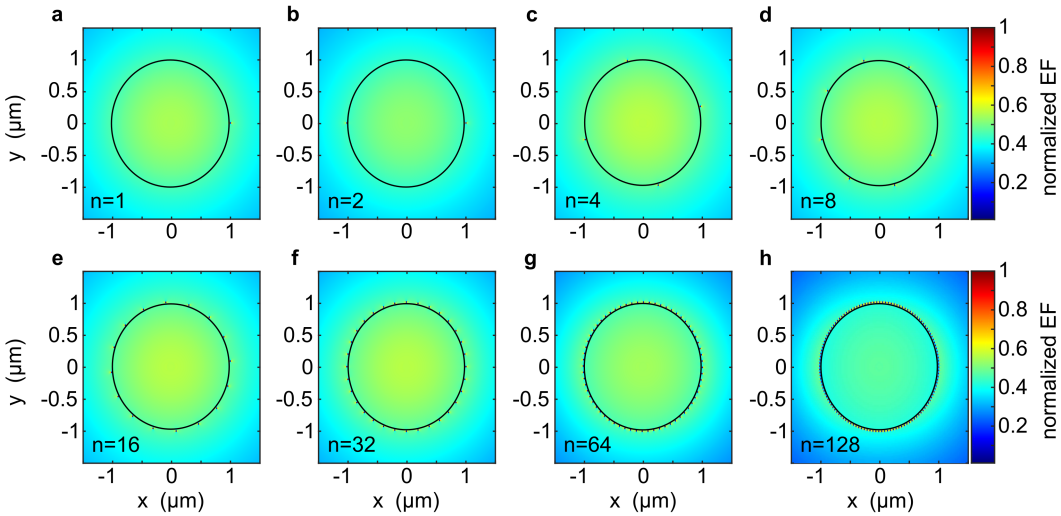

Figure S3: Numerical modelling. Normalised electric field (EF) colormaps calculated according to Eq. 1, of microtapers with $D = 20$ nm, embedded in molecular mixture, with various nanoparticles density: $n = 2p$ where p is a whole number up to 7.

In Fig. S5h, nanoparticles do not overlap for $n = 90$.

Figs. S3-S6, show the increase in normalised EF beyond the physical dimension of the microtaper with increase in nanoparticles density and diameter. However, as nanoparticles density and diameter increases, the microtaper barely guides.

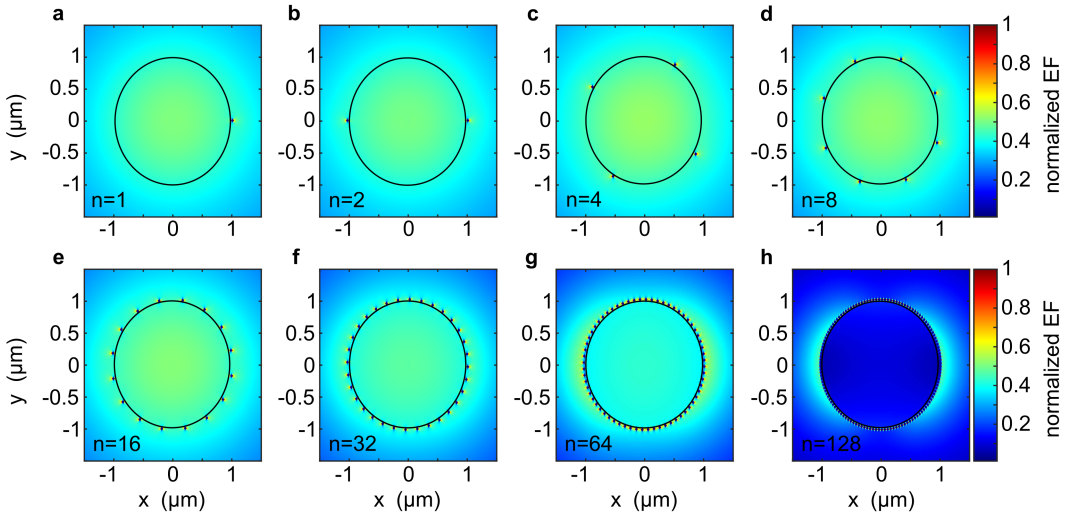

Figure S4: Numerical modelling. Normalised electric field (EF) colormaps calculated according to Eq. 1, of microtapers with $D = 40$ nm, embedded in molecular mixture, with various nanoparticles density: $n = 2p$ where p is a whole number up to 7.

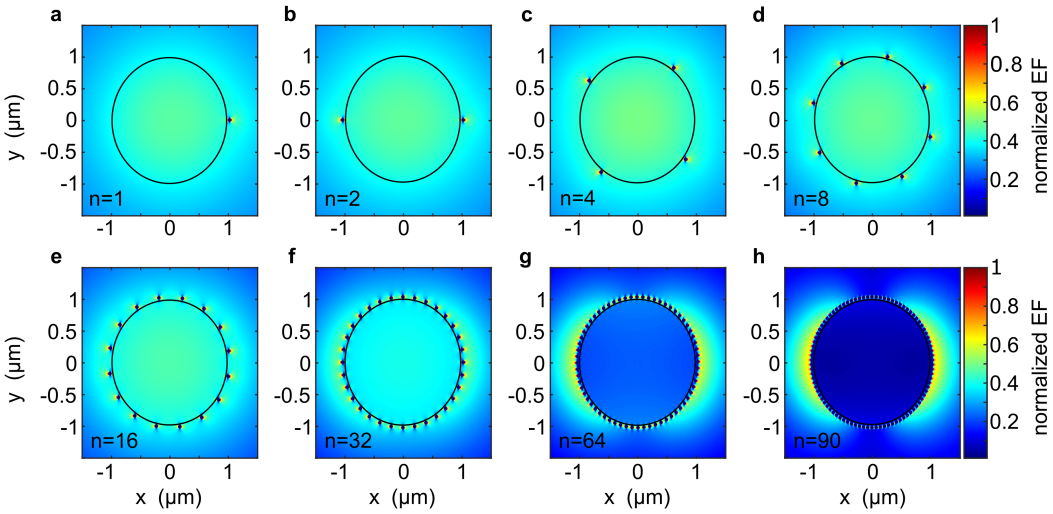

Figure S5: Numerical modelling. Normalised electric field (EF) colormaps calculated according to Eq. 1, of microtapers with $D = 60$ nm, embedded in molecular mixture, with various nanoparticles density: $n = 2p$ where p is a whole number up to 6. $n = 90$ in subplot h.

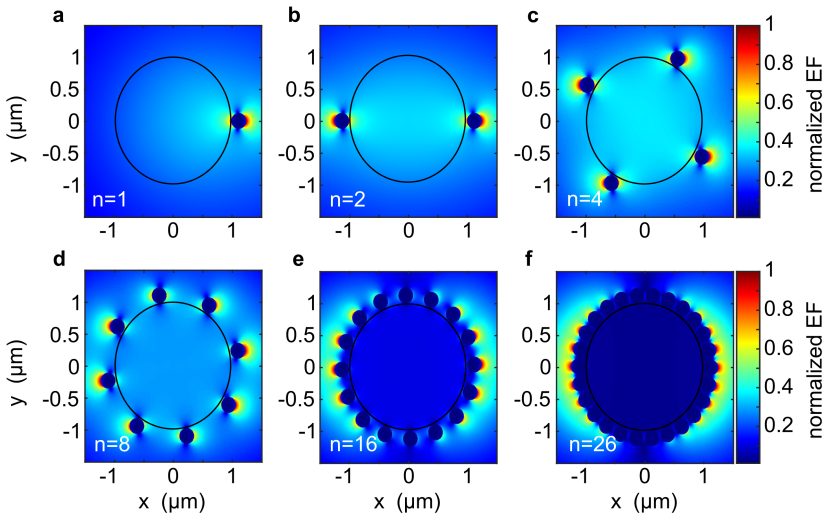

Figure S6: Numerical modelling. Normalised electric field (EF) colormaps calculated according to Eq. 1, of microtapers with $D = 250$ nm, embedded in molecular mixture, with various nanoparticles density: $n = 2p$ where p is a whole number up to 4. $n = 26$ in subplot f.