Supplemental Document

applied optics

D-shaped fiber optic plasmonic sensors using planar and grating structures of silver and gold: design and analysis: supplement

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Design and Analysis of D-shaped Fiber Optic Plasmonic Sensors using Planar and Grating Structure of Silver and Gold

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Supplementary material

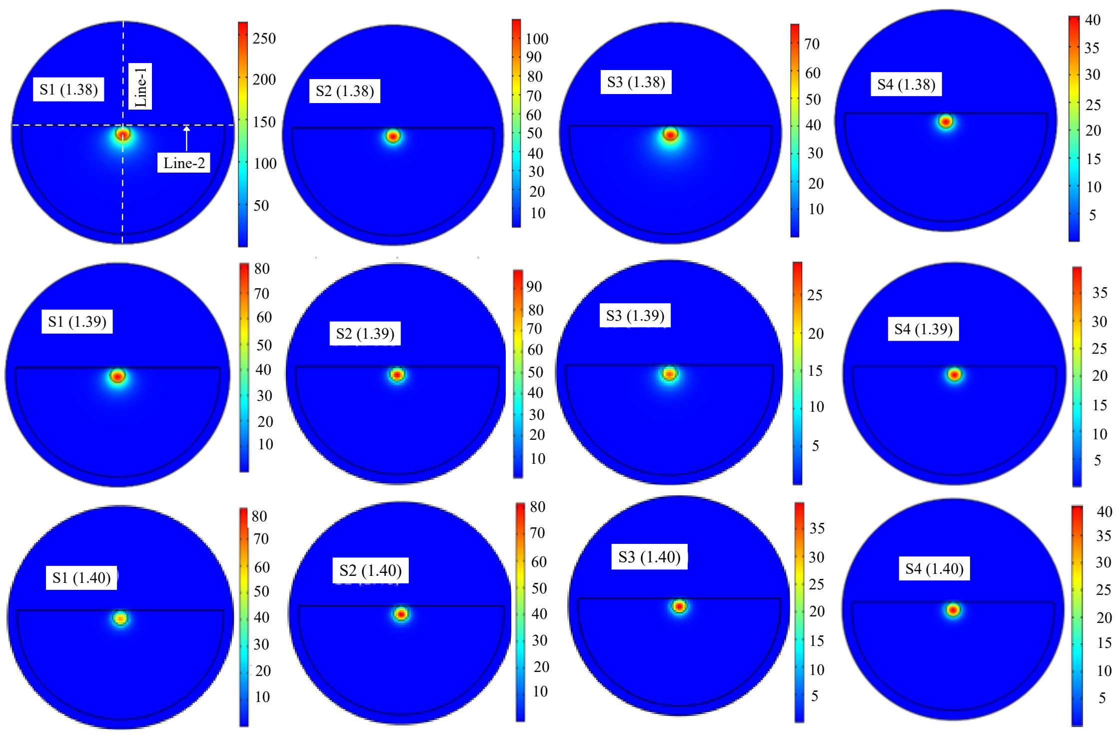

Fig. S1. Electric field $\text{normE} = \sqrt{|E_x|^2 + |E_y|^2}$ at resonance wavelength (λ_r) corresponding to Fig. 2 of main manuscript for all the structures: S_1, S_2, S_3, and S_4 at n_s = 1.38, 1.39, and 1.40. The zoomed view of these electric field distributions are given in Fig. 3 of the main manuscript.

Fig. S1 shows the full view of distribution of electric field, $\mathrm{normE} = \sqrt{|E_x|^2 + |E_y|^2}$, in all of the four considered structures, at resonance wavelength for at ns = 1.38, 1.39, and 1.40. The core portion of these field distributions is zoomed and shown in Fig. 3 of the main manuscript. It can be seen from Fig. S2 that the field is confined in the core for all the structures at n_s = = 1.38, 1.39, and 1.40. It can be observed from Fig. S1 and Fig. 3 of the main manuscript that small quantity of the field leaks out from the core which generates surface plasmons at the metal-sample interface.

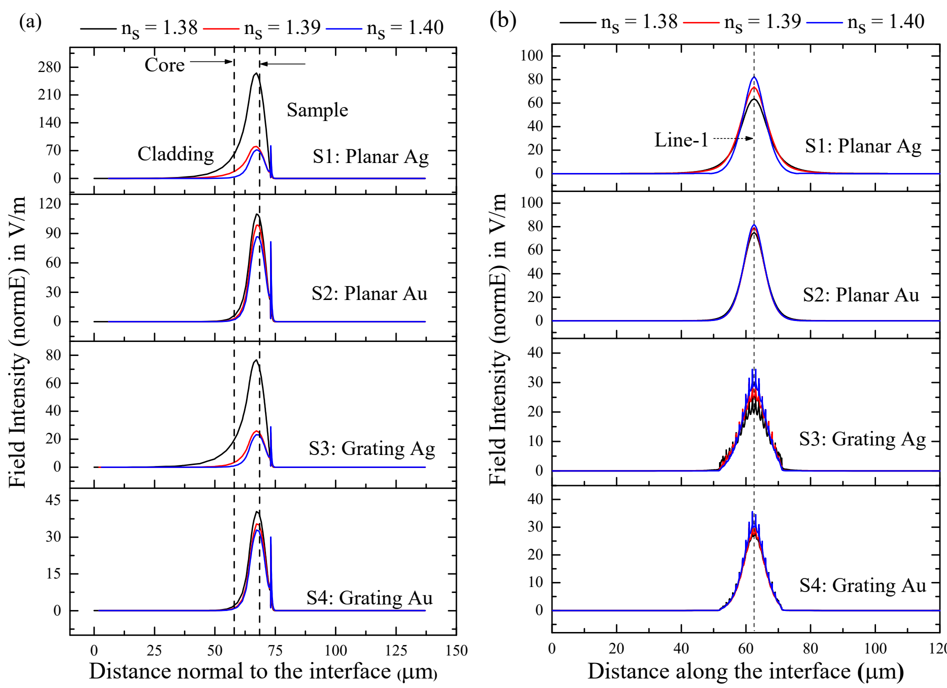

Fig. S2. Full view of distribution of electric field intensity (normE) in accordance with: a) distance along a line normal to the metal-sample interface and passing through center of the core (Line-1 of Fig. S1), b) distance along a line parallel to the metal-sample interface (Line-2 of Fig. S1). The zoomed view of these electric fields is given in Fig. 3(a) and Fig. 3(b) of the main manuscript.

Fig. S2(a) and Fig. S2(b) show the one dimensional (1D) full view of the field distribution along Line-1 and Line-2, respectively, shown in Fig. S1. It can be seen from Fig. S2(a) that small quantity of field leaks out from the core while moving from core to metal layer. It is seen that field intensity is very low at core-metal interface (leaky field or evanescent field). This leaky field generates surface plasmons at metal-sample interface. The intensity of surface plasmon wave (SPW) is almost equal to the maximum field intensity in the core. Further, this SPW decays very fast in the metal as well as in the sample. However, this decrement rate is rapid in the metal whereas it exponentially decreases in the sample, as seen from Fig. 4(a) of the main manuscript. It can be seen from Fig. S2(b) that maximum field intensity of SPW is just above the centre of the core. Further, this SPW is symmetrically distributed with respect to the center of the core. The 1D plots shown in Fig. S2(a) and Fig. S2(b) are used to calculate penetration depth (PD) of field in the sample and propagation length (PL) along the metal-sample interface, respectively. The calculated PD and Pl are given in the main manuscript.