Structurally tunable gear-shaped plasmonic sensor: supplement

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Structurally Tunable Gear-Shaped Plasmonic Sensor: supplemental material

When gold (palik)\(^1\) is used as metal we investigated the influence of core diameter, teeth number and teeth length on the resonance wavelength. The relation is almost same as for the silver metal. Firstly, we analyzed the relation between teeth length and the resonance wavelength. This figure depicts that there is a relationship between resonance wavelength and teeth length where all other parameters are kept constant. Here keeping the thickness of the teeth fixed at 50 nm we varied the teeth length from 50 nm to 100 nm with an increment of 20 nm and the center wavelength exhibits a red-shift as shown in Figure S1. Furthermore, we find the linear trend relationship for different core diameter. The reason of redshift is thoroughly analyzed in our manuscript for silver as metal.

Secondly, three sets of simulation were performed to analyze the effect of teeth number on reflection measurements. For core diameters 100 nm, 150 nm, and 200 nm teeth number is varied respectively from 4, 5, and 8 to the maximums of each of the three diameters. Teeth length is fixed at 100 nm in the three cases. The resonance wavelength undergoes a red-shift with the increase in teeth number as observed in the Figure S2(a-c). The reason behind the effect of these parameters is described in our manuscript. Each set shows almost linear relationship between the resonance wavelength and number of teeth.
Finally, we analyzed the effect of core diameter on resonance wavelength which is shown in Figure S3. The figure exhibits that the resonance seems to undergo a red-shift from 1706 nm to 2392 nm where the teeth length is fixed at 100 nm and the teeth number is set to maximum of corresponding radii. The occurrence of redshift is explained in the paper.

All the plots are shown here when the effect of polarization is negligible.

References