

# Posters

In 1902, Wood reported the observation of a set of sharp changes in reflection spectra from diffraction gratings with metallic grooves that now are well-known as surface Plasmon polaritons (SPPs). Since surface Plasmon resonance (SPR) fields are confined near the vicinity of metal/dielectric, the electromagnetic field in interface will be increased and will decay with increase of distance from each medium. Because of this properties, SPPs have an extraordinary sensitivity to surface conditions and hence has been widely used for sensing applications in biological and chemical species.

Plasmonic nanostructures have a variety of applications in sensors, spectroscopy, solar cells, optoelectronic devices like photo detectors, lasers, and magneto-plasmonics. There are several methods to construct these plasmonic nanostructures. Among these methods, solution processible techniques, using colloidal gold nanoparticles have so many advantages like simplicity, low cost, high efficiency, and uniformity in comparison to construction techniques of plasmonic nanostructure like electron-beam lithography, ion-beam etching, and nano imprinting.

We used a simple and low cost technique to construct a plasmonic nanostructures based on nano-grating and colloidal gold nanoparticles (NPs). In this paper we focus our attention on a specific feature that is exclusive to grating coupling. This feature is the ability to control of propagation direction of plasmon on the plane of the metallic grating. This possibility is provided with conical configuration that in it the wave vector of incident light is not required to be parallel to the grating Bragg vector. When the grating is rotated azimuthally, Symmetry is broken with an additional component due to the grating momentum. As a result, final propagation direction of SPP is no longer perpendicular to the grooves but rotated instead.

The STM image of grating coated with Au NPs is shown in figure (a). It can be compared with the AFM image of plastic grating (figure (b)) before the coating. As it is clear, the Au NPs are aggregated in the valleys of gratings. Figure (c) shows the absorption spectra of Au NPs with the size of 50nm. The plasmon absorption of these NPs is about 550nm.

The SPP propagation angle with respect to the x-axis is given by

$$\psi = 90 - \cos^{-1} \left( \frac{k_{y0} \sin \theta \sin \alpha}{k_{SPP}} \right)$$

Our SPP's response for gold NPs-coated grating shows a normal dip for different azimuthal angles as shown in figure (d) and (e) for sample exposed by 532 and 632.8nm respectively. These plasmonic characteristics can be compare with the SPR excitation of uncoatings coated by an Au thin film with 20nm thickness (figure(f)). It is obvious that excitation of plasmons is happening at the same degree.

In sum, we have been fabricated Au NPs coated grating to use as an efficient SPR sensor. Our

Azimu

[thully control of propagation direction of plasmons in gold nanoparticle-coated diffraction grating-by M.Zamani, M.Amini, S.M.Hamidi, R.Masoudi](#)

can reach the optimized value which gives the 50-50 power output. Moreover, double ring resonator with diamond inner shape is proposed. By changing different factors such as the radius of coupling rods and refractive index, the same power output from 3 ports is demonstrated.

Fig 2. (a) Rsoft layout for proposed double ring resonator structure and (b) Photonic bandgap schematic.

**Introduction**

Photonic crystals (PCs) which are artificially fabricated periodic dielectric structures have gained worldwide interest in the past decade. They have many novel physical properties, which provide a good way to control the propagation of electromagnetic (EM) waves due to the existence of photonic bandgaps (PBG) [1]. Certainly, photonic crystals will build the infrastructure of future integrated circuits. One of the major component of this circuit will be ring resonators in which their outputs can be influenced by various factors such as radius of coupling rods, coupling length, inner rod shape, inner rod radius, scattering rod radius, etc. One of the challenges for photonic crystal ring resonators is obtaining the same output from all the output ports. In this paper, a novel structure for ring resonator is proposed which provides the same output.

**Simulation**

Diamo

[nd-Shape-Nano-Ring-Resonators-Based-On-Photonic-Crystals-By-Foozieh-SohrabSeyyedeh-Mehri-Hamidi](#)

After 1968 that for first E. Kretschmann setup an optical configuration to excite and coupling Surface Plasmons, this field of science possess much more application in other fields of science such as biosensing, magneto-optics and gas sensing. This surface modes only exist in metal-dielectric interfaces and if surface have not appropriate roughness this modes can't exist.

In 1972 Chiu & Quinn for first time studied effect of magnetic field on dispersion relation of metals. After 1972 many researchers investigate affect of magnetic field on different materials such as construction of Noble metal/Ferromagnetic metal structure in 1984 and etc. In this study we use two optimum magneto-plasmonics multilayer systems to enhance magneto-optical Kerr effect, The Au(11nm)/Co(11nm)/Au(11nm) And the Au(20nm)/Co(5nm)/Au(17nm). Our setup is an innovative act.

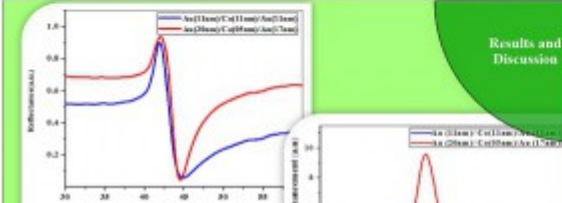
Introduction

In our work gold/cobalt/gold multilayer was deposited in a quartz layer and then this package is glued to a BK7 prism by use index matching oil. The Au(11nm)/Co(11nm)/Au(11nm) and Au(20nm)/Co(5nm)/Au(17nm) multilayers that attached to a BK7 prism by index matching oil to excite Surface plasmons are prepared and simulated and experimental data recorded. The thicknesses and other features of layers previously are determined by MATLAB simulation based on Transmission Matrix Method that will be define afterward.

Transfer matrix method refers a matrix  $M_j$  to j-th layer that all of the optical properties of the layer lies in this matrix. From multiplication of these matrixes for each layer reflection and transmission are obtained. Note that our coating method is Physical Vapor Deposition.

In magneto-plasmonics multilayers we can design systems that their magnetic field enhancement will be so strong and results stronger magneto-optical Kerr effect rotation correspondingly. The magnetic field enhancement reaches its maximum in resonance angle.

Furthermore to obtain maximum Kerr rotation, specimens must be fixed at resonance angle, otherwise Kerr rotation is negligible. our



Results and Discussion

Conclusion

poost

er

بلور فوتونی یک بعدی با ساختار  $(\text{SiO}_2/\text{TiO}_2)^N$  بر روی زیرلایه‌ای شامل توری یک بعدی از جنس پلی‌کربنات که به ضخامت ۱۰۰ نانومتر آلومینیوم بر روی آن لایه نشانی شده است. توسط روش پارکهای الکترونی نشانده شده است.

بررسی جهت شدگی پلاسمون های سطحی در ساختار چندلایه ای شامل بلور فوتونی و همچنین ساختار مربع با استفاده از چیدمان نشان داده شده در شکل مقابل انجام شده است. نحوه‌ی تعریف زوایای قطبی ( $\theta$ ) و سمتی ( $\phi$ ) نیز در این تصویر قابل مشاهده است.

توری های فلزی یک بعدی یا زائنده های خوبی برای نور هستند. مگر در حالتی که بردار میدان مغناطیسی نور فرودی موازی یا خطوط توری باشد و زاویه فرود  $\theta$  دارای مقداری خاص باشد. در این حالت جذب نور به دلیل تحریک نوسانات جمعی الکترونی های رسانشی در نزدیکی سطح توری افزایش می یابد. این جهت شدگی شبه فرآینی به نام پلاسمون های سطحی را تولید می کند که در ناحیه ای اطراف فصل مشترک فلز/ هوا محبوس شده اند. این پدیده در زمانی که هوای بالای توری با یک ماده‌ی دی الکتریک اپروتروپیک همگن با ضخامت کافی جایگزین شود نیز اتفاق می افتد.

جذب تشدیددی در فصل مشترک توری یک بعدی فلزی و ماده‌ی دی الکتریک. تنها با نور یا قطبش p امکان پذیر است. در این حالت انرژی اپتیکی در یک ضخامت زیر طول موجی در ماده‌ی دی الکتریک محبوس می شود و تنها یک مد موج SPP منفرد می تواند در هر طول موجی در یک محدوده‌ی باریک از زاویه‌ی فرود تحریک شود. اگر یک محیط ناهمگن در راستای عمود بر توری فلزی بر روی توری قرار گیرد، امواج SPP چندگانه با حالت های قطبشی مختلف می توانند توسط فصل مشترک فلز/ دی الکتریک منتشر شوند.

مدهای چندگانه، بر خلاف مدهای SPP منفرد، به طور شعبه‌ی به سطح مقیدند و بنابراین میدان افزایش یافته توسط آنها در ماده ی دی الکتریک بالای آنها (PC) گسترده می شود و میتواند جذب توسط این ماده را که در کاربردهای سلول خورشیدی مفید است افزایش دهد. وقتی میدان افزایش یافته توسط SPP در محیط دی الکتریک پخش شود (زیاد جایگزیده نباشد) انرژی کمتری توسط فلز تلف می شود و این انرژی می تواند توسط محیط دی الکتریک (مثلا محیط جاذب در سلول خورشیدی) جذب شود.

نتایج

نتیجه گیری

300