Analisis localized surface plasmon resonance pengaruh konfigurasi dimer nanorod perak menggunakan boundary element method (BEM) = Analisys of localized surface plasmon resonance of AgNR dimer configuration effect with boundary element method

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Abstrak

Telah diamati pengaruh konfigurasi dimer AgNR yaitu side by side dan end to end terhadap sifat optis Localized surface plasmon resonance dengan menggunakan pendekatan boundary element method. Medium yang digunakan pada penelitian ini adalah air dengan indeks bias sebesar 1.334. Variasi aspek rasio nanorod 1 hingga 5 dilakukan untuk mengetahui pengaruhnya terhadap pergeseran puncak LSPR serta juga dilakukan variasi jarak pisah antar nanorod perak. Fungsi dielektrik perak menggunakan hasil percobaan Johnson Christy. Dengan memvariasikan arah medan listrik sejajar sumbu utama nanorod mode Longtudinal dan tegak lurus sumbu utama nanorod mode Transversal didapati bahwa pergeseran puncak LSPR selain bergantung pada jarak pisah antar coupling nanorod namun juga terhadap konfigurasi dimer AgNR yang masing-maing memiliki 2 mode yaitu Transversal dan Longitudinal yang muncul akibat asimetri bentuk nanorod. Pada konfigurasi end to end mode Transversal pergeseran puncak LSPR cendrung bergeser ke arah panjang gelombang yang lebih pendek Blue-shift seiring dengan pengurangan jarak pisah antar nanorod dan pada mode Longitudinal didapati pegeseran puncak LSPR mengalami Red-shift. Sedangkan pada konfigurasi side by side memperlihatkan fenomena pergeseran puncak LSPR yang berkebalikan dengan konfigurasi end to end untuk mode Transversal dan Longitudinal. Ketergantungan pergeseran puncak LSPR terhadap konfigurasi dimer AgNR ini bisa dijelaskan secara kualitatif melalui interakasi dipole-dipole antar nanorod yang berdekatan.

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It has been observed that the influence of AgNR dimer configurations which side by side and end to end on optical properties of Localized surface plasmon resonance by using boundary element method approach. The medium used in this reasearch was water with a refractive index of 1,334. Variations in nanorod aspect ratio 1 to 5 were performed to determine the effect on the LSPR peak shift as well as the variation of separations between silver nanorods. The silver dielectric function based on Johnson Christy 39 s experimental results. By varying the direction of the electric field parallel to the main axis of nanorod Longtudinal mode and perpendicular to the main axis Transverse mode , that two modes arising from the asymmetry of nanorod shape. it is found that the peak shift of LSPR is dependent on the spacing between the nanorod coupling but also the configuration of the AgNR dimer. For end to end assembly, Transversal mode shows that LSPR peak shift tends to shift towards the shorter wavelength Blue shift along with the reduction of the spacing between the nanorod and for Longitudinal mode LSPR peak shift has Red shifted. While for side by side configuration shows the phenomenon of LSPR peak shift in contrast to the configuration of end to end for Transverse and Longitudinal modes. The dependence of the LSPR peak shift to this AgNR dimer configuration can be explained qualitatively through dipole dipole coupling interaction between adjacent nanorods.