

INTISARI

KAJIAN SIFAT OPTIK DAN LISTRIK NANOFIBER POLIANILIN DAN POTENSINYA SEBAGAI BIOSENSOR BERBASIS *SURFACE PLASMON RESONANCE (SPR)*

oleh

Ngurah Ayu Ketut Umiati

09/294438/SPA/00291

Telah dilakukan kajian mekanisme sintesis dan fabrikasi polianilin *nanofiber* menggunakan metode polimerisasi interfasial dan elektrospinning. Dalam disertasi ini dikaji sifat optik dan listrik polianilin *nanofiber* dalam potensinya sebagai *biosensor surface plasmon resonance (SPR)*. Polianilin *nanofiber* merupakan material yang diminati untuk biosensor karena bahan ini mampu dan efektif sebagai mediator untuk transfer elektron dalam reaksi redoks maupun enzimatik. Morfologi permukaan polianilin *nanofiber* yang jauh lebih luas dibandingkan polianilin konvensional, mengakibatkan proses difusi molekul ke dalam struktur *nanofiber* polianilin berlangsung lebih cepat serta penetrasi molekul semakin dalam sehingga berpotensi untuk meningkatkan sensitivitas dan responsivitas dari suatu sensor.

Polianilin nanofiber yang digunakan dalam disertasi ini, diperoleh melalui metode polimerisasi interfasial antara fase air (dopan, inisiator dan aquadestilata) dan fase organik (toluena sebagai pelarut organik dan monomer anilin). Selain itu metode elektrospinning juga digunakan untuk menghasilkan fiber dari larutan polianilin yang sebelumnya diperoleh dari polimerisasi interfasial tersebut. Berdasarkan percobaan yang telah maka diperoleh hubungan antara variasi molar dopan *Hydrogen Chlorida (HCl)* terhadap parameter utama biosensor SPR dan hubungan antara rasio molar anilin dengan inisiator *ammonium peroxidisuphate (APS)* terhadap parameter utama biosensor SPR melalui karakteristik mikrostruktur, optik dan listrik polianilin *nanofiber*, demikian pula yang terjadi dari metode elektrospinning.

Hasil eksperimen tersebut menunjukkan bahwa diameter nanofiber polianilin yang terbentuk diamati semakin kecil dan fiber yang terbentuk semakin jelas ketika konsentrasi asam yang digunakan semakin besar. Nilai indeks bias n dan κ semakin meningkat seiring dengan meningkatnya konsentrasi molar dopan HCl yang digunakan. Dari pengamatan resistivitas ditunjukkan bahwa molaritas dopan HCl mempengaruhi tingkat konduktivitas polianilin nanofiber. Semakin tinggi molaritas maka konduktivitas semakin meningkat. Sudut SPR yang diperoleh juga semakin bergeser ke kanan seiring dengan peningkatan molar dopan.

Kata Kunci :

polianilin nanofiber, optik, listrik, SPR

ABSTRACT

A STUDY OF OPTICAL AND ELECTRICAL PROPERTIES OF POLYANILINE NANOFIBRE AND ITS POTENTIAL AS A BIOSENSOR BASED ON SURFACE PLASMON RESONANCE (SPR)

by

Ngurah Ayu Ketut Umiati

09/294438/SPA/00291

Polyaniline nanofiber is a promising biosensor material with effective capability in mediating electron transfer in enzymatic and redox reactions. The polyaniline nanofiber surface morphology, which is broader than the conventional polyaniline, causes a faster and deeper molecular diffusion process into the structure. The morphology also makes the nanofiber a potential material to increase a sensor sensitivity and responsiveness. In this dissertation, optical and electrical properties of polyaniline nanofiber as a potential surface plasmon resonance (SPR) biosensor were observed by conducting a study mechanisms to synthesize and fabricate polyaniline nanofiber using interfacial polymerization and electrospinning methods.

The interfacial polymerization between water (dopants, initiator and aquadestilata) and organic phases (toluene as an organic solvent and aniline monomer) was used to create the polyaniline nanofiber and afterward, the electrospinning was conducted to produce fibers from a polyaniline nanofiber. By using interfacial polymerisation method, a relation between dopant molar hydrogen chlorida (HCl) variations and SPR biosensor main parameters and between the aniline molar ratio and ammonium peroxidisulphate (APS) was investigated using the observation of polyaniline nanofiber microstructural, optical and electrical characteristics as the main parameters of SPR biosensor as well as electrospinning method.

The experiment results shown that by using a scanning electro microscope, the diameter of polyaniline nanofiber became clearly apparent and smaller as the concentration of dopant molar HCl increased. However, the increase of the dopant concentration gave no effect to the uniformity of nanofiber. The value of the refractive index n and κ was found increase as the concentration of dopant molar HCl was increased. It was found from observations that the resistivity of the dopant HCl molarity affected the level of conductivity of polyaniline nanofiber. As the molarity of dopant HCl was higher then the conductivity was also increased. The obtained SPR angle was also increasingly shifted to the right along with increment of molar dopant.

Keywords :

polyaniline nanofibers, optic, electric, SPR