

ABSTRACT

Surface Plasmon Resonance (SPR) biosensors have made remarkable progress in many fields, including being used for environmental monitoring, biotechnology, medical diagnostics, drug testing, food safety, and security. To achieve maximum results from the SPR method is to increase the momentum of light so that the light vector wave in the electric medium increases, which is needed to excite radiation on the surface plasmon. The problem faced is to get optimal results in terms of sensitivity, detection accuracy, and quality factor by using metamaterials with supporting materials such as silver, gold, and copper.

The purpose of this study was to model using a Kretschmann configuration with five layers, namely glass, silver, copper as a metamaterial model, gold and air. As for the optimization of the SPR sensor in the form of sensitivity, detection accuracy, and quality factor, simulations are carried out by changing the thickness of the size of the materials used and the shape of the resonator on the copper used. Furthermore, the simulation is processed using software such as WinSpall and Lumerical FDTD.

The results of this study through simulations by changing the thickness of 4 layers of materials, namely silver from 50 nm to 30 nm, metamaterial from 200 nm to 150 nm, copper from 50 nm to 10 nm, and gold from 50 nm to 10 nm. The simulation results show that the SPR curve shifts from 36.8° and R_{in} gets 0.0372 to 44.8° and R_{in} gets 0.015089. Meanwhile, the sensitivity is $53.33^{\circ}/RIU$ then the detection accuracy is 5.5 and the quality factor is 16.66. The use of metamaterials in SPR can increase the sensitivity, detection accuracy and quality factor.

Keyword : *Metamaterial, Surface Plasmon Resonance, Sensitivity, Detection Accuracy, Quality Factor*