

Development of an internet web application for the study of surface plasmon resonance spectroscopy

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An online web application incorporating a user friendly graphical user interface (GUI) programmed in Java Server Faces (JSF) coupled with Primefaces component suite was developed for the theoretical study of Surface Plasmon Resonance (SPR) of different materials using the characteristic transmission matrix (CTM) method based on Maxwell's equations. The present web application investigates the SPR optical parameters of spectral and angular responses using angular and wavelength modulation of a Kretschmann configuration which is widely used for biological, chemical and gas sensing applications. CTM method is based on the solution of Maxwell's equations for a plane electromagnetic wave of particular wavelength and the boundary conditions for multilayered media with plane parallel boundaries. The convenience of this technique is that with increasing number of layers, each layer is characterized by its own matrix. Importantly for practical and useful scientific and engineering applications it is highly desirable to have such theoretical problems involving SP calculations programmed in suitable computer languages so that the computation process becomes fast, accurate and reliable. Moreover with the advancement of high performance computing systems and network technologies, development of interactive visualization environment in the form of software, integrated with GUI or internet web interface which are based on different theories, becomes feasible. The accuracy, efficiency and reliability of the web application were validated by comparing the results generated by using the web application with other benchmark theoretical results and results of SPR experiments with standard samples. Importantly, development of such a web interface will be very useful for the plasmonics community as it will avoid the necessity of having adequate knowledge of the respective programming languages or local installation of the software.