**ABSTRACT**

The technique of Surface plasmon resonance has become a highly influential method for its chemical, bio-chemical and gas sensing applications due to its compactness, flexibility and reliability. Recent reports convey that Surface Plasmon Resonance has also been involved in the energy conversion of solar energy harvesting with the application of metamaterials. Surface Plasmon resonance imaging involves the detection of material properties like density, temperature, concentration, refractive index measurement under various environmental conditions. A detailed numerical analysis on the performance parameter of an optical fibre based SPR sensors with Graphene layers over four different metals Pt/Au/Ag/Cu have been studied. The inclusion of Graphene layer is found to improve the sensitivity of the sensor. The thickness of the metal layer, its dielectric constants and the thickness, length and refractive index of the sensing layer is properly chosen and the sensitivity evaluation is done. The attenuated total internal reflection method along with Krestchmann configuration has been employed for the evaluation. The effects of the metal structures considered and its thicknesses on the transmitted spectrum of the proposed sensor is analysed. Amongst the various chosen combinations, the proposed optimized Platinum Graphene coated SPR sensor shows greater sensitivity than the previously reported spr sensors.