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High performance multilayer surface plasmon sensors KUNAL TIWARI, SURESH SHARMA, NADER HOZHABRI, University of Texas at Arlington — Though high performance SPR sensors are readily available, it remains desirable to fabricate sensors with enhanced sensitivity, resolution and evanescent fields for numerous applications. Since SPR characteristics of bimetallic (Ag/Au) and bimetallic waveguide coupled (Bi-WC) sensors are known to be better than those of single metal sensors,[1] we have undertaken investigations of the performance of multilayer structures.[2] We employ the transfer matrix method (TMM) for calculating SPR characteristics of such structures as functions of Ag/Au and Si_3N_4 waveguide thickness. Several quartz/Ag/Si_3N_4/Au structures were deposited in a *class-100* clean room facility. The thicknesses of Ag and Au were fixed at 35 and 28 nm respectively. However, the thickness of the intermediate Si_3N_4 waveguide layer was varied from 50 - 150 nm. The SPR curves were measured for all these structures by using the Kretschmann configuration system. We observe excellent agreement between the experimental SPR data and computational results. For an optimized 150 nm thickness of Si_3N_4 waveguide, we observe high sensitivity to changes in the refractive index ($S_n \approx 52^0$/RIU), extremely narrow SPR curves (FWHM$\leq$0.28, yielding high figure-of-merit of 60-180) and increased decay length of evanescent fields ($\delta \approx 258$ nm).

[1]K. S. Lee, T. S. Lee, I. Kim, and W. M. Kim, J Phys D Appl Phys 46 (12) (2013).
[2]K. Tiwari, S. C. Sharma and N. Hozhabri, submitted (2014)

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