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Structural and system configurations for enhancing the performance of plasmonic biosensors

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Several structural and system configurations for improving the performance of plasmonic biosensors are presented based on improving the reading method and enhancing the EM field further for improving the sensitivity and lowering the detection limit based on SPR, SERS and SEF. The structural improvements include: planar thin metal films combined with dielectric films in the Kretschmann-Raether configuration, periodic metallic structures on planar substrate, Nano-sculptured thin films prepared by the glancing angle deposition technique and lately and Combination of nanostructures with thin metal films for coupling of extended surface plasmons (ESP) to localized surface plasmons (LSP). The system improvements include: diverging beam approach in the angular mode and polarimetric spectral mode. Particularly, we have shown recently that even much higher enhancement of the EM fields (1-3 orders of magnitude) is obtained by exciting the LSPs through extended surface plasmons (ESPs) generated at the metallic film surface using the Kretschmann-Raether configuration. The largest EM field enhancement and the highest SEF and SERS intensity are obtained when the incidence angle is the ESP resonance angle of the underlying metal film.

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