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Graphene Based Tunable SPR Sensors ERGUN SIMSEK, George Washington University — Today's highly mobile world requires widely deployable disease detection and monitoring systems. We need compact, sensitive, and cost-effective biosensors, which can also tolerate a wide range of operating conditions to be field-deployable. Especially for point-of-care diagnostics, where the testing environment can be highly variable, it would be advantageous to have sensors with tunable operating ranges. To address this need, we propose tunable, localized surface plasmon resonance (SPR) based biosensors using graphene layers and metal nanoparticle arrays. Tuning capability is achieved by bias voltage applied to the thin layers of the substrate, where on metal nanoparticle arrays are fabricated. The key component of the design is graphene. The applied voltage changes not only optical properties of graphene but also the induced dipole moment of each nanoparticle and hence the resonance wavelength of the sensor. For the modeling of proposed tunable biosensors, we use both a frequency domain approximate solver (layer medium coupled dipole approximation) and a full wave time-domain electromagnetic solver (Wavenology). Numerical results obtained with these two independent solvers reveal the tuning capability of the proposed structures.

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