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Performance Analysis of Graphene-Coated GaAs SPR Sensor for Detection of DNA Hybridization

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The present paper provides a numerical analysis of DNA hybridization occurrence on graphene-coated GaAs SPR sensor (SF10 prism–Au–GaAs–Graphene–Phosphate buffer saline (PBS) solution). The angular interrogation method is used to comprehend sensor performance through SPR curves. Single-stranded DNA present in PBS solution, on hybridization with its complementary DNA, results in desorption from nanostructures, enabling detection of DNA hybridization event. The proposed SPR sensor shows remarkable performance for detection of DNA hybridization, with sensitivity $\sim 153.32^\circ$ per refractive index unit (RIU), detection accuracy $\sim 0.62 \text{ deg}^{-1}$, and quality factor $\sim 9.45 \text{ RIU}^{-1}$.

Keywords: SPR sensor, DNA hybridization, angular interrogation method, Kretschmann configuration, surface plasmon waves.