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Understanding Graphene-induced Large Shift of Surface Plasmon Resonance (SPR) of Au Films: The Challenge of Microscopic Modeling for Macroscopic Observation KAMRUL ALAM, Univ of Houston, CHAO NIU, Baylor Univeristy, YANAN WANG, Univ of Electronic Science and Technology of China, WEI WANG, Chinese Academy of Sciences, YANG LI, CHONG DAI, XIAONAN SHAN, E.JOE CHARLSON, Univ of Houston, XIANG-TIAN KONG, Univ of Electronic Science and Technology of China, YANDI HU, Univ of Houston, ALEXEY BELYANIN, Texas AM University, GILA STEIN, Univ of Tennessee, ZHAOPING LIU, Chinese Academy of Sciences, JONATHAN HU, Baylor Univeristy, ZHIMING WANG, Univ of Electronic Science and Technology of China, JIMING BAO, Univ of Houston — With the emergence of Graphene and other 2D materials, it was proposed that capping Au film with graphene could improve the performance of SPR based sensors due to enhanced local field and surface chemical adsorption. Such enhanced SPR sensitivity is further modelled and experimentally confirmed by many groups. However, the very SPR angle shift induced by 2D materials and its physics has been overlooked. We investigated the graphene induced SPR shifts in air by comparing experiment with modelling. A shift of 0.30^0 is observed and it is 3 times larger than that from conventional modeling. We show steps to build more realistic model and evaluate the effect on SPR from surface morphologies of Au and graphene, anisotropy of graphene, and charge transfer between graphene and Au. This study illustrates the challenges in understanding the SPR of noble metal films modified by atomic scale materials and calls for more advanced and realistic modelling.

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