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Development of doped and plasmonic graphene for transparent conductive electrodes and photodetector JIANWEI LIU, GUOWEI XU, RONGTAO LU, RONGQING HUI, JUDY WU, University of Kansas Dept. of Physics & Astronomy — Graphene nanohole arrays (GNAs) were fabricated using nanoimprint lithography. The improved optical transmittance of GNAs is primarily due to the reduced surface coverage of graphene from the nanohole fabrication. The exposed edges of the nanoholes provided effective sites for chemical doping using thionyl chloride was shown to enhance the conductance by a factor of 15-18 in contrast to only 2-4 for unpatterned graphene. We fabricated plasmonic graphene using thermally assisted self-assembly of silver nanoparticles on graphene. The localized-surface-plasmonic effect is demonstrated with the resonance frequency shifting from 446 nm to 495 nm when the lateral dimension of the Ag nanoparticles increases from about 50 nm to 150 nm. The plasmonic graphene shows much improved electrical conductance by a factor of 2-4 as compared to the original graphene, making the plasmonic graphene a promising advanced transparent conductor with enhanced light scattering for thin-film optoelectronic devices. Along this direction, we developed a scheme of photodetection based on ionic liquid gated graphene with plasmonic metal nanostructures.

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