Enahanced UV Photoluminescence and Photocurrent Response from Graphene-ZnO Nanowire Hybrids

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Abstract Lack of band gap in CVD grown large area single layer graphene motivates the researchers towards integration of highly conductive graphene with photosensitive semiconducting nanostructures to achieve enhanced optoelectronic functionalities for ultrafast photodetection and photovoltaic applications.[1-2] Herein, we demonstrate the graphene as versatile 2D platform to grow various ZnO nanostructures by catalyst mediated and catalyst free growth approaches. Further, we fabricate the graphene-ZnO nanowire (NWs) hybrid based UV photodetectors with two orders magnitude higher UV photosensitivity as compared to bare ZnO NWs.[3-4] We evaluated the specific role of graphene in the enhancement of UV sensitivity by fabricating a graphene-ZnO thin film hybrid device. Time response of the UV photocurrent measurement showed fast response and recovery times with bi-exponential growth and decay profiles under light ON/OFF conditions, due to increased charge transport of graphene in graphene-ZnO hybrid. The cyclic photoresponse measurements reveal that, the high mobility of graphene reduces the recombination rate of photogenerated carriers. As a result, the lifetime of photogenerated free charge carriers was greatly increased.

References

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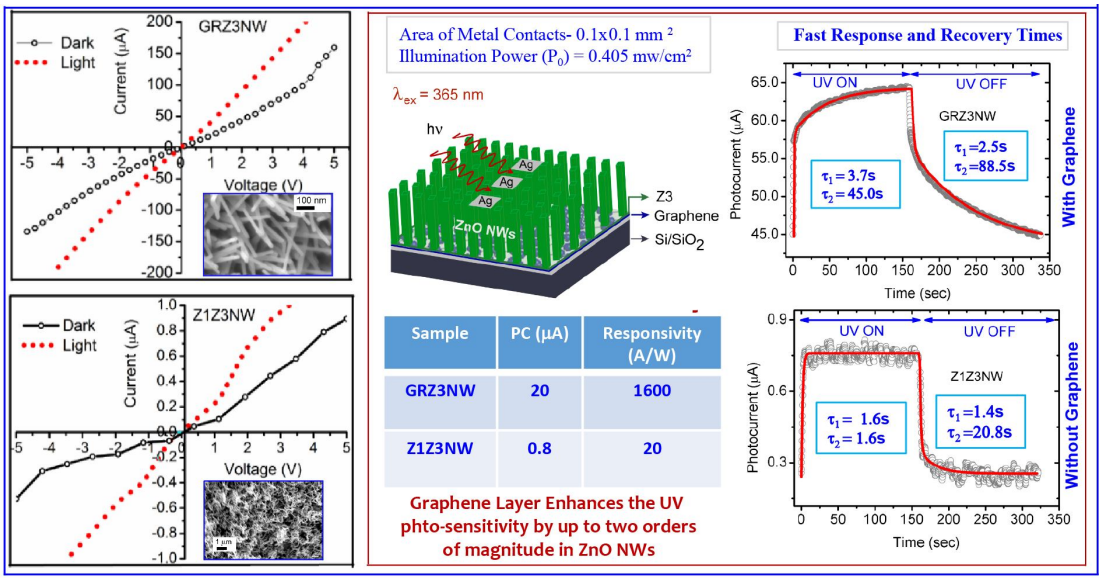
Figures



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