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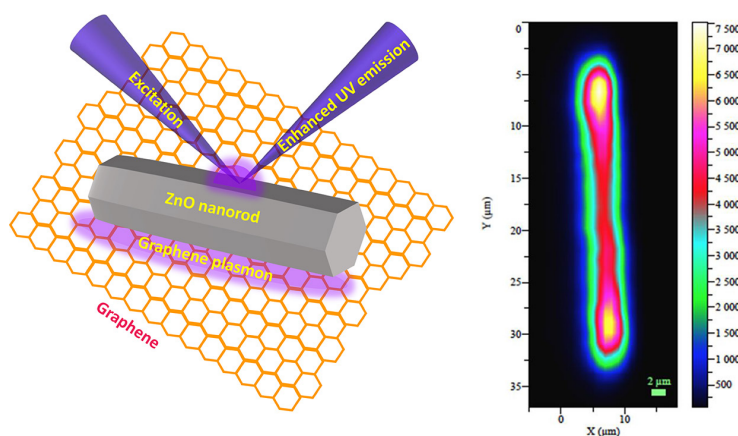
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The high crystallinity of ZnO along with surface plasmon activity of graphene enhances photoluminescence emission of zinc oxide nanorods grown on graphene.



Graphene is ideal for growing hexagonal wurtzite crystal due to its honeycomb lattice structure. Growing nanorods of the semiconductor zinc oxide, ZnO, on graphene can increase the functionality of both materials, giving them new electronic and optoelectronic applications such as light-emitting diodes, or LEDs. In order to better utilize these materials for these applications, it is important to better understand the optical properties of ZnO-nanorod/graphene heterostructures.

Sahoo et al. grew ZnO nanorods on graphene and observed their intense ultraviolet photoluminescence emission at room temperature using photoluminescence spectroscopy. They observed enhanced photoluminescence emission from ZnO grown on graphene than from ZnO grown on other van der Waals surfaces such as highly oriented pyrolytic graphite and mica.

The researchers concluded that the enhanced ultraviolet emission of the ZnO nanorods is partly due to their high crystallinity, thanks to the matching lattice of graphene and ZnO, and partly due to graphene surface plasmons. When the authors mapped the photoluminescence signal of a single ZnO nanorod on graphene, they found the signal intensity to be the highest along the central axis, gradually decreasing outward. From this map, Sahoo et al. deduced that ultraviolet photons get trapped at the interface of graphene and ZnO and then are modulated by the surface corrugation of graphene that resonantly excites plasmon modes, which further enhances the ultraviolet emission.

Satyaprakash Sahoo said that their results are of practical importance in designing future optoelectronic devices by combining inherent properties of graphene and wide bandgap semiconductors like ZnO.

Source: “Enhanced ultraviolet emission from self-assembled ZnO nanorods grown on graphene,” by S. K. Das, Gopal K. Pradhan, Avanendra Singh, P. K. Sahoo, and Satyaprakash Sahoo, *Journal of Applied Physics* (2018). The article can be accessed at <https://doi.org/10.1063/1.5064395>.

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