

Charge transfer in a graphene/titania nanosheet hybrid structure under UV irradiation

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Heterostructures consisting of different two-dimensional materials create novel electronic/optical properties for future flexible devices. We have recently focused on titania (titanium oxide) nanosheets which have specific properties related with hydrophilicity and photocatalysis [1]. In our earlier works, we observed a large humidity dependence [2] and UV photoresponse [3] in a device with single-layer titania nanosheet. In this presentation, we will report a fabrication method for a graphene/titania nanosheet hybrid structure and preliminary results under UV irradiation.

We deposited titania nanosheets on a mechanically exfoliated few-layer graphene by using Langmuir-Blodgett (LB) technique. Figure 1 shows an AFM image of the hybrid structure. The titania nanosheets with a thickness of 1 nm are densely covered with the graphene. Figure 2 shows a KFM image of the hybrid structure under UV irradiation. The surface potential of the titania nanosheets decreases comparing with that of the graphene, which indicates that photo-excited electrons are transferred from the titania nanosheets to the graphene under UV irradiation.

References

- [1] R. Ma and T. Sasaki, *Adv. Mater.*, 22 (2010) 5082.
- [2] A. Tanaka et al., *Appl. Phys. Lett.*, 104 (2014) 163106.
- [3] K. Matsuzaki et al., *Appl. Phys. Lett.*, 106 (2015) 033104.

Figures

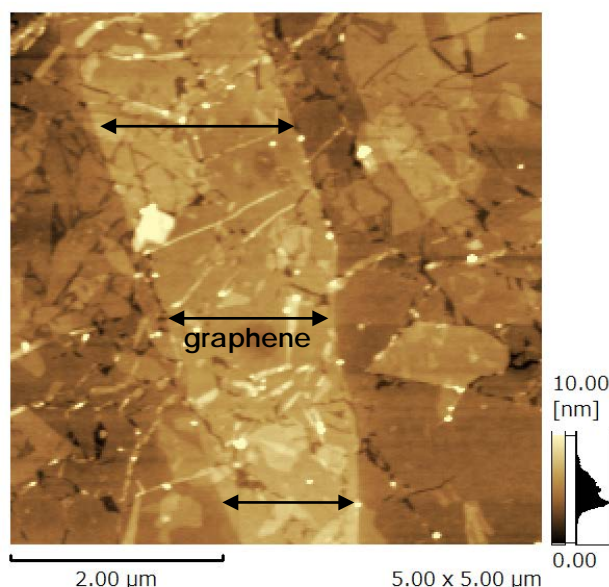


Figure 1: AFM image of a graphene/titania nanosheet hybrid structure.

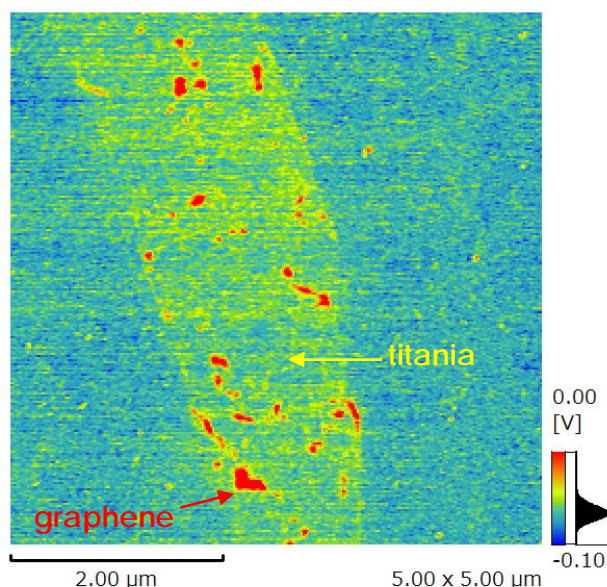


Figure 2: KFM image of a graphene/titania nanosheet hybrid structure under UV irradiation.