# Transparent Phototransistor for Visible Light Detection Based on Graphene Nanoclusters

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In this work, we design and demonstrate a transparent photosensor for visible light detection by using well distributed Graphene nanoclusters as the absorber. The graphene nanoclusters were disolved in the polymer and was applied on top of transparent oxide semiconductor by spin coating. The graphene nanoclusters coated oxide semiconductor exhibit about 1~3 % light absorbance (Fig.1) since both Graphene and oxide semiconductor are not light sensitive at visible range. [1] This transparent material system was applied as channel in a transistor to implement light detection. This transistor is called phototransistor.[2] In this device, the almost negligible light absorption can by magnified by tansistor gain. The blue (450 nm), green (532 nm) and red (650 nm) diode laser were used to measure the visible light detection. With graphene nanocluster in phototransistor, the respobsivity is larger than 1 A/W and 0.1 A/W for 532 nm and 650 nm, respectivly. (Fig. 2) Such a high responsivity indicate the graphene phototransistor couuld possiblely used in visible light communication, photo-touch screen, live cell detection, and artificial vision.

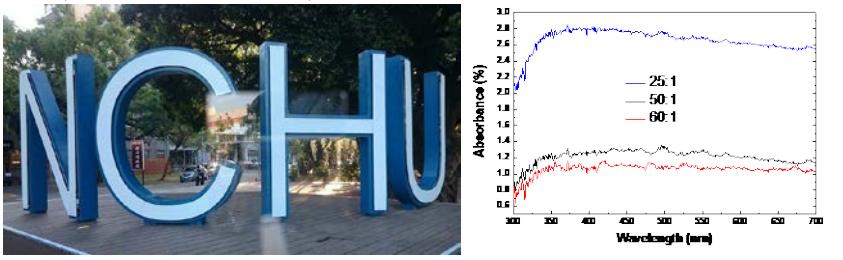


Figure 1: Picture for the graphene nanoclusters on glass and the absorbance spectrum.

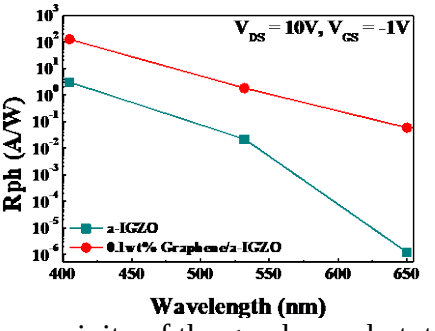


Figure 2: The detected responsivity of the graphene phototransistor at visible regime.

[1] R.R. Nair, P. Blake, A.N. Grigorenko, K.S. Novoselov, T. J. Booth, T. Stauber, N.M. R. Peres, A. K. Geim, Science, **320**, 1308 (2008).
[2] Z. Pei, H.-C. Lai, J.-Y. Wang, W.-H. Chiang, C.-H. Chen, IEEE Elec. Dev. Lett., **36**, 44 (2015).

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