

## Electrical conductivity and optical transparency measurements of thin carbon films

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The outstanding electrical, mechanical and chemical properties of graphene make it attractive for applications in flexible electronics. [1]

Experiments were performed at the lowered pressure in the flow-type reactor. The system involved the horizontal tube furnace, the temperature control systems, gas flow controllers and forvacuum pump. Cu foil was used as a wafer. Thin carbon films were obtained by pyrolysis of ethanol vapor.

Then we measured the transmittance of graphene transferred to a polyethylene terephthalate (PET) substrate using an ultraviolet-visible spectrometer. The sheet resistance was measured using the four-point probe method.

The films display appreciable electrical conductivity and good transparency (92-95%). Because the transmittance of an individual graphene layer is 2,3% [2], this transmittance value indicates that the average number of graphene layers is two to four. These results were verified by atomic-force microscopy measurements.

- [1] Kim K.S., Keun S.K., Yue Z., Houk J., Sang Y.L., Jong M.K., Kwang S.K., Jong-Hyun A., Philip K., Jae-Young C., Byung H. H. *Nature* **457**, 706 (2009).
- [2] Nair R. R., Blake P., Grigorenko A. N., Novoselov K. S., Booth T. J., Stauber T., Peres N. M. R., Geim A. K., *Science* **320**, 1308 (2008).