Graphene Transparent Electrodes for Display Applications

Kisoo Kim[1], Young-Duck Kwon[1], Chonghan Park[1],Sungjae Yoon[1], Seungmin Cho[1]
[1]Hanwha Techwin R&D Center, Seongnam-si, Gyeonggi-do 13488, South Korea
Tel.:82-70-7147-5100, E-mail: seungmin72@hanwha.com

Graphene, a single atomic layer of graphite, attracts enormous interest from academia and industry. Because of unique properties such as high mobility of charge carriers, ultra high young's modulus and thermal conductivity, graphene is studied as candidate material for future applications in various fields such as electronics, optoelectronics, composite materials, and thermal management. Among many applications, transparent electrodes for (flexible) display are expected to be near term applications.

Chemical vapor deposition (CVD) has enabled the growth of single layer graphene on copper foil. However, The practical use of graphene in consumer electronics is hampered, since the size, uniformity, and reliability problems are yet to be solved to satisfy industrial standards. In this presentation, we report rapid thermal chemical vapor deposition (RT-CVD), improved etching and transfer methods, which enabled faster and larger production of homogeneous graphene films over 400 x 300 mm2 area. Resulting graphene films on PET have 90% total transmission (including PET) over the visible wavelength with sheet resistance ~220 Ω/sq. Mechanical and optical characterization of graphene films are conducted to investigate the quality of graphene films.

Display applications are manufactured incorporating graphene films as transparent electrodes. Single and multipl layer graphene is used to fabricate touch panel and OLED applications.

Fig. 1. graphene touch screen installed in a mobile phone(left)

Acknowledgment

This work was supported by the Ministry of Trade, Industry and Energy through Technology Innovation Program (Grant 10044410). Soft I/O interface research section of ETRI contributed to fabricating and characterizing OLED devices.

References

1. J. Ryu, Y. Kim, D. Won, N. Kim, J. S. Park, E. –K. Lee, D. Cho, S. –P.Cho, S. J. Kim, G.H. Ryu, H. –A. S. Shin, Z. Lee, B. H. Hong, and S. Cho., ACS Nano, vol. 8, no. 1, p. 950 (2014)
2. S. J. Kim, J. Ryu, S. Son, J. M. Yoo, J. B. Park, D. Won, E. –K. Lee, S. –P. Cho, S. Bae, S. Cho, and B. H. Hong, Chem. Mater., vol. 26, p. 2332 (2014)