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TÉMA

Roll-to-roll deposition of graphene film by microwave plasma CVD

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Transparent conductive films are used in a lot of applications such as touch screens, solar cells and displays. ITO is the most commercial materials, however, a substitute material for ITO, due to limited supplying indium, is one of the key technologies to be solved.

Graphene based films are considered to be one of the appropriate transparent conductive films of which substitute of ITO since graphene consists of carbon atoms. Although the transparent conductive films based on graphene films were fabricated by thermal CVD [1] and reduction of graphene oxide [2], these reported techniques required higher process temperature and long time. For the transparent conductive film based on graphene films, it is necessary to develop continuous deposition of graphene film at low process temperature.

Roll-to-roll process is used in mass production for film depositions on flexible and plastic substrates. Therefore, a combination of roll-to-roll deposition and plasma CVD is expected to be solve the higher process temperature and long process time. However, it has not yet been established for industrial mass production up-to-now.

We report about continuous graphene film deposition on Cu foil with 297 mm in width by combination of roll-to-roll microwave plasma CVD deposition and fabrication of transparent conductive film based on graphene film by transferring method. A pair of winder and unwinder was built into linear antenna type microwave plasma CVD system [3]. Raman spectra indicate that a uniform graphene film is obtained 297 in width is confirmed. Graphene based transparent conductive films are obtained by transferring graphene film from Cu foils to PET films. A uniform and high optical transparency of transferred graphene/PET structures are obtained.

[1] S. Bae et al., Nature Nanotechnol. 5, 574 (2011).
[2] H. Yamaguchi et al., ASC Nano 4, 524 (2010).
[3] T. Yamada et al, Carbon 502615 (2012)

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