

Large-area Graphene Production using Roll-to-roll (R2R) Technology

Arnaldo Galbiati⁽¹⁾, James Huang⁽²⁾

⁽¹⁾SOLARIS PHOTONICS, London, U.K.

⁽²⁾KINGYOUOP OPTRONICS, Taipei, Taiwan (R.O.C)

admin@solaris-photonics.com

Abstract

Only 10 years have passed since Geim and Novoselov first used adhesive tape to isolate graphene from graphite, since then, tens of graphene manufacturing companies have been created all over the world, which can produce small graphene sheets as well as large-area, high-quality graphene films on an industrial scale exceeding 400 tonnes and 110,000 m² per year.

The Chemical Vapor Deposition (CVD) technique produces high-quality graphene films by the catalytic decomposition of hydrocarbons on a metal (for example, Cu, Ni, Pt or alloy) surface at high temperatures, and the films are then transferred to transparent substrates such as glass and polymers by etching away the metal or by non-destructive electrochemical bubbling for transparent conductive film (TCF) applications. In this paper we will present state-of-the-art Roll-to-roll (R2R) CVD growth and transfer techniques that have been developed to fabricate large-area graphene for various applications such as functional coatings, conductive inks, batteries and supercapacitors, transparent electrodes in touch panels, displays and photovoltaic devices as well as for novel flexible electronic devices.

References

- [1] Novoselov, K. S. et al. *Science* 306, (2004) 666–669
- [2] Zhu, Y. W. et al. *Adv. Mater.* 22, (2010) 3906–3924
- [3] Novoselov, K. S. et al. *Nature* 490, (2012) 192–200
- [4] Bonaccorso, F., Sun, Z., Hasan, T. & Ferrari, A. C. *Nature Photon.* 4, (2010) 611–622
- [5] Kim, K. S. et al. *Nature* 457, (2009) 706–710
- [6] Li, X. S. et al. *Science* 324, (2009) 1312–1314
- [7] Bae, S. et al. *Nature Nanotech.* 5, (2010) 574–578
- [8] Kobayashi, T. et al. *Appl. Phys. Lett.* 102, (2013) 023112
- [9] Gao, L. B. et al. *Nature Commun.* 3, (2012) 699
- [10] Dai, B. Y. et al. *Nature Commun.* 2, (2011) 522

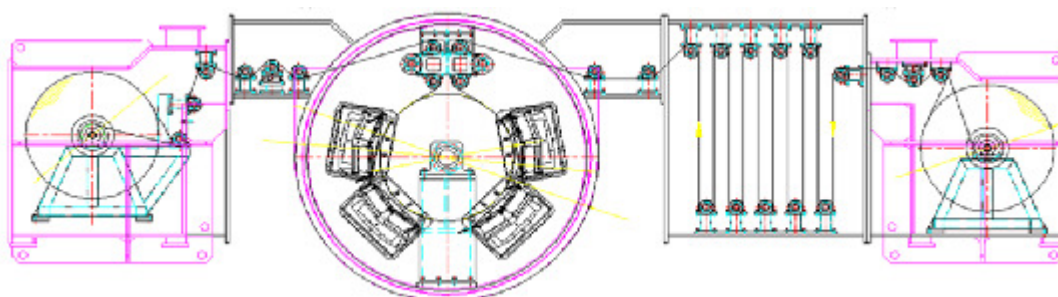


Figure: 1, Large-area Graphene production equipment using Roll-to-roll (R2R) technology