



Official Opening of Tera-Barrier Films Pte Ltd in Singapore

Abstract

Breakthrough of ultra high barrier substrate/film has finally been commercialized by the opening of a spin-off company, Tera-Barrier Films Pte Ltd in Singapore with the first investor from Applied Ventures, LLC, a venture capital arm of Applied Materials, Inc. The barrier film is able to provide the critical requirement of WVTR for OLED display, which is 10^{-6} g/m².day to significantly prolong the lifespan of the devices. Moreover, it has time lag of 2300 hours before moisture is able to pass through the film, remarkably outperformed any existing barrier film technologies. Tera-Barrier is focusing to market the barrier films for solar and display markets, and currently at roll-to-roll film fabrication scale-up effort. Tera-Barrier projected that in 2011, their pilot plant in Singapore will be up and running and able to have mass production line by 2013.

A new spin off company based in Singapore named Tera-Barrier Films Pte Ltd from the Institute of Materials Research and Engineering (IMRE) Singapore had just been officially opened on 25 August 2009. The opening was marked by the signing ceremony of the three organizations involved, namely Tera-Barrier Films Pte Ltd, Applied Ventures, LLC and Exploit Technologies Pte Ltd (ETPL). Applied Ventures, LLC, as the venture capital arm of Applied Materials, Inc has agreed to make strategic investment in Tera-Barrier to develop further and manufacture a new proprietary barrier films that will be able to significantly prolong the lifespan of devices such as organic solar cells and flexible displays. Tera-Barrier has also signed a license agreement with ETPL, the marketing and commercialization arm of the Singapore Agency for Science, Technology and Research A*STAR, to obtain the rights to develop and market products using the breakthrough flexible barrier substrate technology. In addition, both Tera-Barrier and IMRE signed a Memorandum of Understanding for IMRE to provide the corporate laboratory and office space for Tera-Barrier to allow research continuity and uninterrupted development of the films.

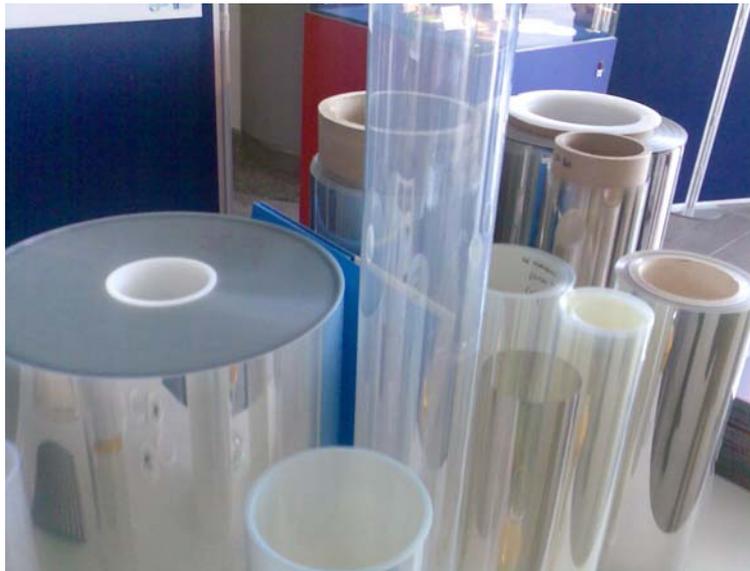
High performance barrier substrate development started since 1999 in IMRE. In a nutshell, the barrier film is essentially a unique barrier stack design, which has a layer of nanoparticles between the pinholes existing in oxide layers. The nanoparticles plug the gaps and cracks in the oxide layer, making the layer a more impermeable layer. In addition, the nanoparticles absorb and retain water and oxygen molecules, thus reducing the number of barrier films to two layers only instead of three to five layers required in competitors' films. It has been tested and validated by the Centre for Process Innovation in UK, that Tera-Barrier films are able to achieve WVTR (water vapour transmission rate) of

10^{-6} g/m².day at 60°C and 90% relative humidity (RH). For comparison, current commercially available barrier films exhibit WVTR of only 10^{-3} g/m².day at 25°C and 90% RH. More remarkably, their films are exhibiting very long time lag of ~2300 hours before moisture passing through the films at 60°C and 90% RH, about 1000x more impervious than current existing technologies. The films have also been tested to survive over 10K bending cycles for flexibility performance.

The advantages of the barrier films include flexibility, lightweight, transparency (85%), UV filter, large area, roll-to-roll (R2R) process, printing techniques, and most importantly it brings down the manufacturing cost significantly by 50%. Tera-Barrier team has successfully resolved the challenges they faced earlier in developing this barrier film that include the nanoparticles dispersion, agglomeration, Al₂O₃ surface modification, film adhesion, bubble formation and the R2R process.

Currently, Tera-Barrier is focusing on developing the barrier films for the R2R manufacturing line. The scaling up of R2R film fabrication is ongoing with target of 1800mm wide and 500m/min throughput rate. In addition, at present the production is being subcontracted to overseas partners and the large scale subcontractors are being evaluated. Tera-Barrier also partners with KISCO for their marketing and commercialization effort for the Asia Pacific region. The business model that Tera-Barrier adopts is the manufacturing of ultra high barrier films for solar and display market. Looking at the value chain, Tera-Barrier positions themselves together with BASF, Bayer, Sumitomo, and Dow as the materials supplier, who provides materials for the equipment makers such as Applied Materials and General Vacuum. Eventually, the films can be utilized by the device and application-oriented manufacturers.

Tera-Barrier projected that by Q1 2010, they should be able to do commercial production with large scale subcontract. They are now starting the 2nd round fund raising targeting at S\$10 million by January 2010 for setting up the manufacturing line/pilot plant in Singapore. By 2011, the pilot plant is projected to be up and running and will be able to have mass production line by 2013. Eventually, by 2014, Tera-Barrier expected to exit at about S\$400M valuation or more.



Flexible barrier films produced by Tera-Barrier Films Pte Ltd



One example of application: flexible organic solar cell encapsulated in the flexible barrier film