

# **New packaging plastic that protects as well as aluminium foil**

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Tera-Barrier Films Pte Ltd, a spin-off company from A\*STAR's Institute of Materials Research and Engineering, has invented a new plastic film using a revolutionary nano-inspired process that makes the material thinner but as effective as aluminium foil in keeping air and moisture at bay. The stretchable plastic could be an alternative for prolonging shelf-life of pharmaceuticals, food and electronics, bridging the gap of aluminium foil and transparent oxide films.

The new plastic by TBF has one of the lowest moisture vapour transmission rates (mvtr), preventing air and moisture from penetrating the layer. The plastic has an air and moisture barrier that is about 10 times better than the transparent oxide barriers which are currently being used to package food and medicines owing to its uniquely encapsulated nanoparticle layer. The film has been validated by a number of companies and potential commercialisation partners.

TBF's 700nm encapsulated nanoparticle barrier films - which are thinner than a strand of human hair - have high transparency and are also stretchable, features not possible with aluminium-based packaging material. Inorganic barrier thin films are highly transparent but have lower barrier property and are not stretchable. TBF's films will allow see-through packing and a longer shelf-life for a wide range of products from high-end electronics to perishable goods. Stretchability is another attractive feature in facilitating simple packaging processes.

Aluminium as a metal has very high oxygen and moisture barrier

properties, but aluminium-based packaging comes at a higher processing cost, is opaque, non-stretchable, and interferes with electronics, making the integration of components like RFID devices difficult. TBF's new stretchable thin films are cost effective and transparent, with barrier properties comparable to that of aluminium foil.

"TBF's strategy is to bridge the gap between [aluminium foil](#) and transparent oxide films by creating new packaging structures for the niche applications in the food, medical, pharmaceuticals and electronics markets," says Senthil Ramadas, Director & Chief Technology Officer of TBF. "The secret behind TBF's film lies in our patented encapsulated nanoparticle layer that consists of nanoparticles in polymer shells".

Conventional multilayer barrier plastics have successive layers of barrier plastic films to enhance the impermeability to air and moisture but they have not achieved higher barrier properties. TBF's film uses minimal layers as its encapsulated nanoparticles increase the packing density of nanoparticles, which in turn makes it extremely difficult for water and oxygen molecules to pass through the film. The encapsulated nanoparticles also actively adsorb and react with water and oxygen molecules to trap them, thus further lowering the amount of moisture and air passing through the film.

"The innovation creates a whole new generation of packaging materials that add new and superior functions for use in high value products such as medicine", says Professor Andy Hor, Executive Director of A\*STAR's IMRE from where the unique barrier film technology was initially developed, incubated and spun-off. "We are glad to see our scientist-entrepreneurs advancing an IMRE-born technology and are looking forward to seeing it make an impact in the market".

"The University of Tokyo confirmed TBF's barrier film performance at 10-6g/m<sup>2</sup>/day", says Mr. Nakazawa, Managing Director, KISCO (Asia)

Pte. Ltd. "There has been very favourable response from our potential customers in a spectrum of industries wishing to benefit by incorporating TBF's superior barrier films into their products, these applications range from food and medical packaging to high end PV, lighting and display sectors where TBF's barrier films excel."

TBF was recently recognised by leading Global Growth consulting firm, Frost & Sullivan as the '2013 Global Next Generation Technology Company of the Year in the field of Barrier Films' due to its novel approach of developing innovative technology for its patented barrier material and barrier stack technology that enhances the performance and reliability of barrier films. TBF has pioneered a unique and innovative technology for developing barrier films, by using nanoparticles to plug the defects in the barrier oxide layer, thereby enhancing barrier effectiveness and at the same time, reducing the number of barrier layers needed.

TBF's reduced number of barrier layers and lower material costs, as compared to conventional barrier film technologies, brings in tremendous cost efficiencies into TBF's manufacturing process. With TBF's unique technology and low cost, access to newer applications like Quantum dot color filters, Vacuum Insulated Panels (VIPs), Food & Medical Packaging has been made possible in addition to the conventional application areas like OLED displays or lighting and flexible Solar cells. This opens up a wide spectrum of opportunities for the barrier films market and TBF's barrier films are well positioned to address the needs from these new and emerging applications.

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