

Toray Develops Super High Barrier Film Offering Dramatically Lower Costs



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Toray Industries, Inc.

Tokyo, Japan, April 25, 2022 – Toray Industries, Inc., announced today that it has developed super high barrier film that costs at least 80% less than conventional counterparts. This saving stems from the film's unique design and formation technology. The company looks to commercialize the film in 2023 for high barrier performance applications. These include flexible devices and solar cell encapsulation.

With the rapid progress of the Internet of Things towards a smart economy, demand for wearable biometric sensors, flexible displays, and other flexible devices should expand in the coming years. In addition, worldwide efforts to attain carbon neutrality have drawn attention to renewable energy and energy harvesting (see glossary note 1), and demand should grow for organic photovoltaics and perovskite solar cells.

For these applications, it is vital to encapsulate organic devices and compounds to safeguard them from moisture. Super high barrier films for encapsulation are conventionally fabricated through sputtering (note 2) or chemical vapor deposition (note 3), which enable the formation of defect-free, high-density thin films. Both fabrication processes are slow and costly, however, impeding efforts to expand applications.

Toray therefore applied high-density composite film design technology cultivated by the development of sputtered film, and fast vapor deposition technology for barrier film in food packaging and other applications. By doing so, the company attained a high barrier performance, delivering a water vapor transmission rate of 10^{-3} [g/m²·day] which is equivalent to levels from sputtered and chemical vapor deposited film. Deposition with this super high barrier vapor deposited film is more than 100 times faster than with regular sputtering, at a more than 80% lower cost. Toray's new film is also very transparent and flexible, making it ideal for flexible devices and solar cells. It can thus help expand the Internet of Things market and materialize a carbon-neutral economy.

Toray will keep researching and developing innovative materials that can transform economies by leveraging its core technologies of synthetic organic and polymer chemistry, biotechnology, and nanotechnology. It will thereby materialize its commitment to delivering new value that contributes to society.

Glossary

1. Energy harvesting processes convert light, heat, vibration, and other peripheral energy sources into electricity.
2. Sputtering is a physical vapor deposition vacuum process to form thin films. This technology introduces an inert gas into a vacuum chamber to generate plasma that collides with target surfaces to remove particles on the film of the target to deposit them on the substrate surface.
3. Chemical vapor deposition is a method for forming films. It transforms raw materials into gases and uses heat, plasma, light, or other energy sources to excite and accelerate chemical reactions and deposit thin films on substrate surfaces.

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