

Flexible and Transparent SWCNT/SiO₂ Composite Films

- Next-Generation Transparent Conductive films

柔軟で透明な SWCNT/SiO₂複合膜

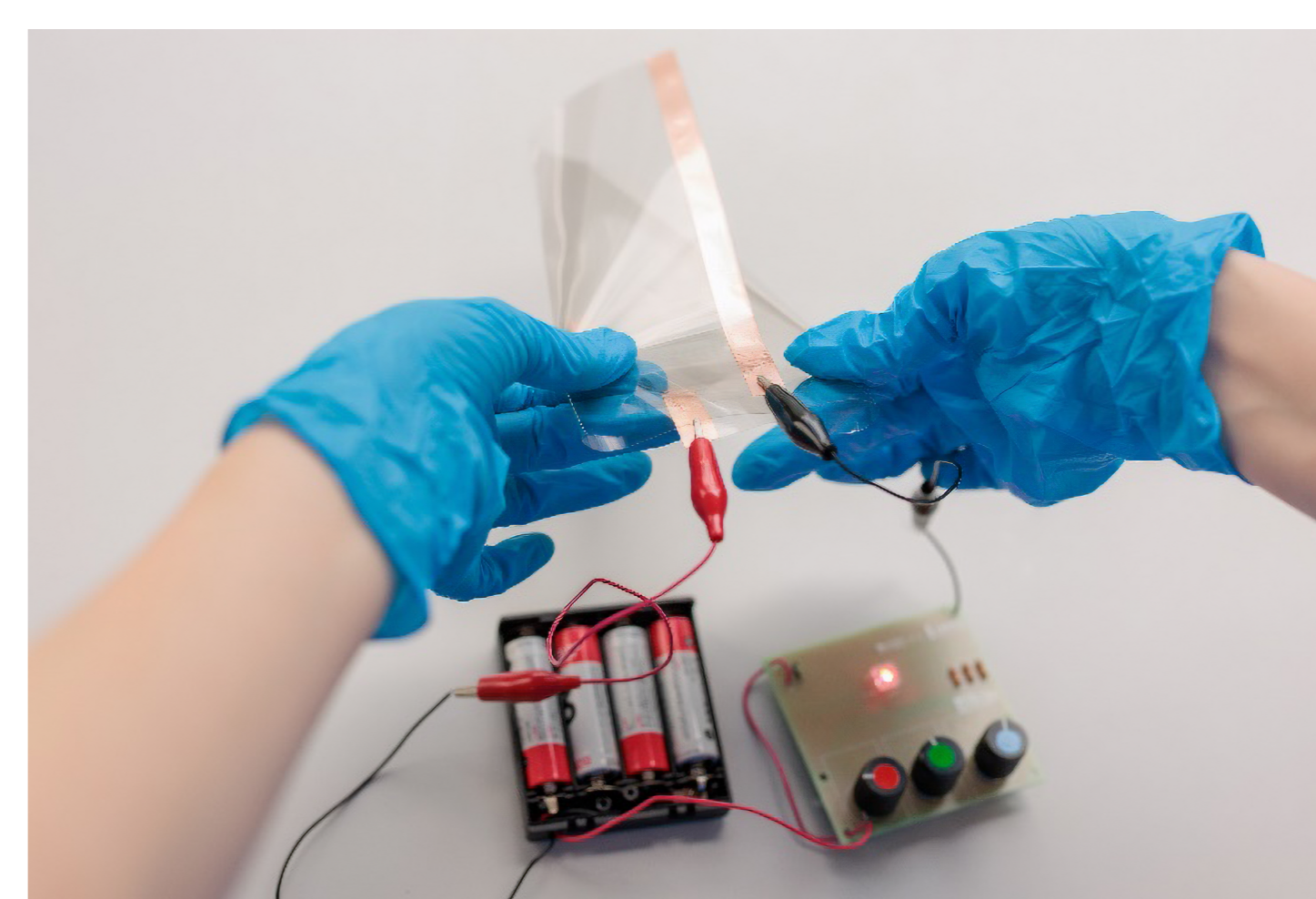
- 次世代の透明導電膜

Keywords: Molecular precursor method, Thin film, Wet process, Metal-free, Flexible, Transparent conductive film, Novel composite material

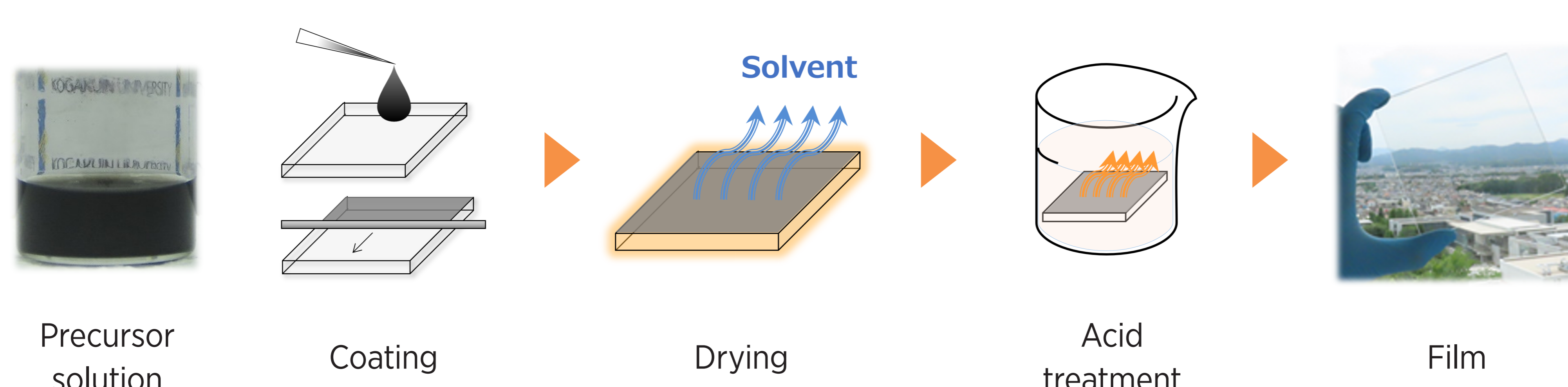


Abstract - 概要 -

A novel, highly transparent, conductive film was formed on a plastic substrate using an SiO₂ precursor solution containing dispersed carbon nanotubes (CNTs). This conductive film can be formed through simple steps such as solution coating, drying, and acid treatment, with no need of vacuum apparatus. Furthermore, it is metal-free, low-cost and highly flexible.



カーボンナノチューブを分散させた SiO₂ 用プレカーサー溶液を出発原料としてプラスチック基板に高い透明性を持つ導電膜を形成できます。この導電膜は真空装置を使用せず、溶液塗布と乾燥後に酸処理などの簡単なステップで膜形成が可能です。また、この導電膜は、金属を含まず、安価で、高い柔軟性をもちます。



Selling Points - セールスポイント -

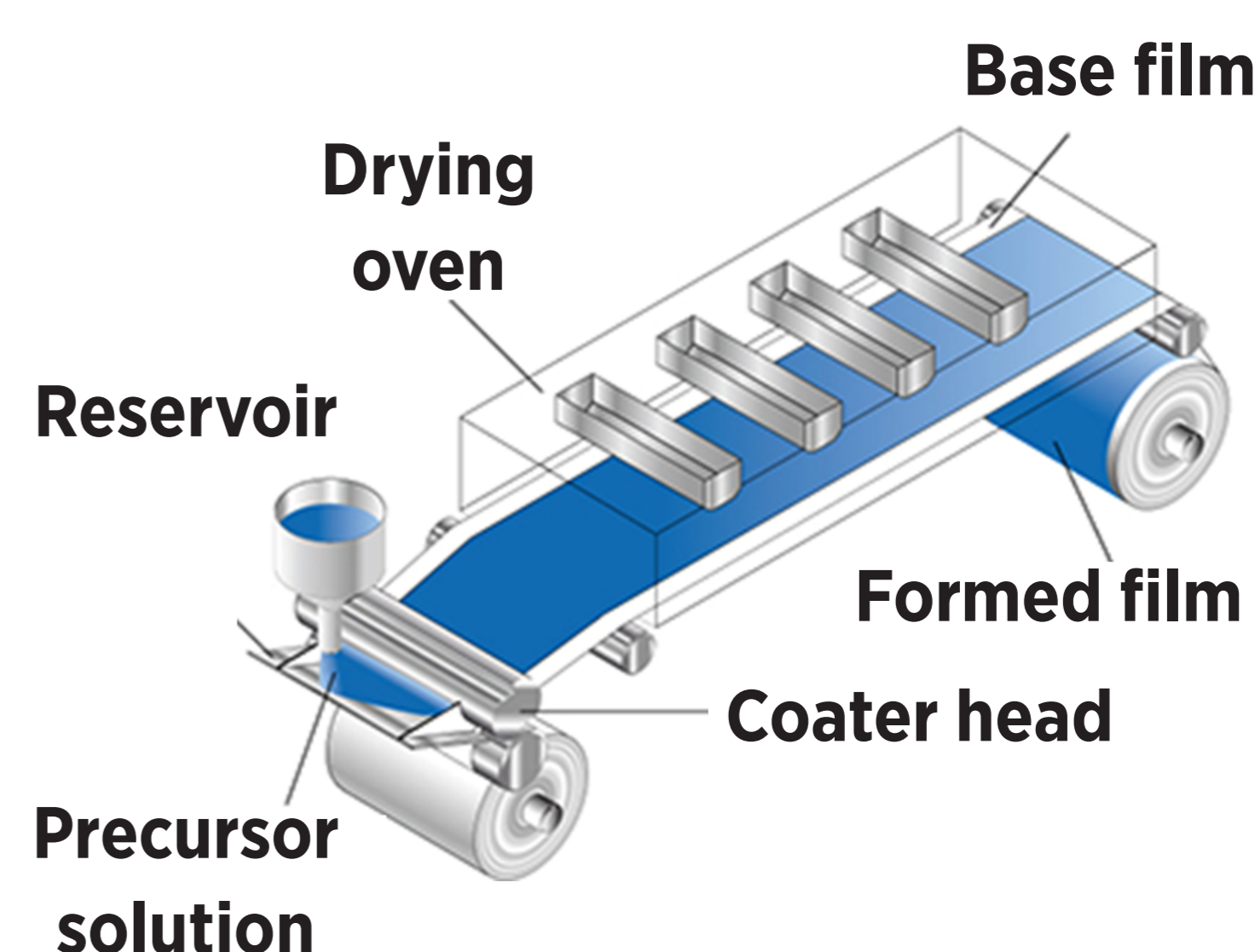
Category	Sheet resistance (Ω/sq)	Transmittance (%)	Flexibility	Durability	Cost	Process
SWCNT/SiO ₂	90	85	Excellent	Very High	Low	Coating
ITO	20	88	Slightly poor	High	High	Sputtering
Ag nanowire	0.2	> 80	Excellent	Moderate	Medium	Coating
Conductive polymer	260	85	Excellent	Low	Low	Coating

✓ Film formation via a simple process

This transparent conductive film can be formed by applying this solution, followed by acid treatment at ambient temperature. The precursor solution is highly suitable with roll-to-roll (R2R) processing and the cost-effective manufacturing of large-area products.

✓ 簡便なプロセスによる成膜

この透明導電膜は、室温大気中での溶液塗布と酸処理で成膜可能です。用いるプレカーサー溶液は、ロールトゥロールへの適用で低コストかつ大面積化が期待できます。



Roll-to-roll process

✓ Stable Pricing and Supply

Because this transparent conductive film does not contain metals such as silver or indium, which are commonly used in this technology, it is not affected by market trends or price fluctuations due to global events. Therefore, it enables stable supply and predictable costs.

✓ 安定した価格と供給

この透明導電膜は、この分野でよく使われる銀やインジウムなどの金属を含まないため、市場動向や世界情勢に左右される価格変動の影響を受けません。したがって、安定した価格で供給が可能です。

✓ Composite materials with transmit NIR and UV light

This novel composite material leverages both properties of SiO₂ and CNT to provide high strength, transparency, and adhesion on plastics. It maintains clarity across a wide wavelength range of light, and its refractive index (~1.7) is nearly that of glass.

✓ 赤外線・紫外線を透過する複合材料

SiO₂ と CNT 両者の性質を複合させたこの新規複合材料は、高強度でかつ幅広い波長の光に高い透明性を示し、かつプラスチック基材への優れた密着性を備えています。このフィルムの屈折率は、約 1.7 でガラスとほぼ同等です。

✓ Excellent flexibility and conformability

Even when the film material is bent so strongly that creases form on the plastic substrate, the film adheres perfectly to the deformed surface, conforming to it and maintaining its conductivity. This makes it an ideal candidate for flexible electronics devices.

✓ 優れた柔軟性

プラスチック基板に跡がつくほど完全に折り曲げた状態でも基板に追従して導電性を示します。