High transparent and conductive film

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1. Introduction

Various types of materials for anti-static films and electromagnetic shielding films have been introduced in the market based on the synthesizing, coating, and patterning processes for our proprietary conductive ultrafine particles. Presented below is a new process, using special screen printing material and technology, for creating a highly transparent and conductive film with a more than 2 digits lower surface resistivity /□ than existing ones and a total transmission of over 70%.

2. Main Features of the High-transparency and High-conductivity Film

1) Structurally controlled in detail having conductive and light transmitting (opening) areas, creating visibility visually equivalent to a near uniform film (Fig. 1).

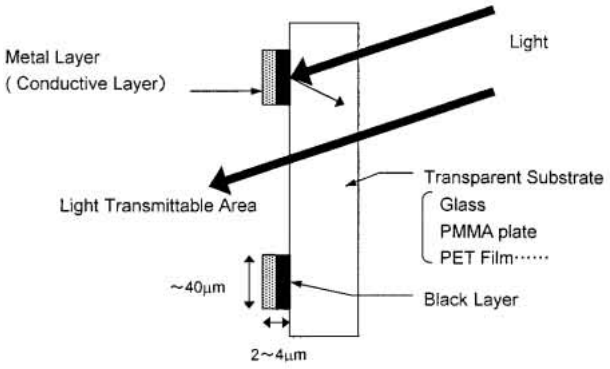

Fig. 1 Schematic representation of cross sectional structure of high-transparency and high-conductivity film

2) The minimum printable line width in conventional screen printing is said to be 60 ~ 80μm. Using special printing material and technology, we have realized very fine line patterning with the line width of below 40μm in the conductive area (Photo 1).
3) Pattern shape, pitch, bias angle, and other parameters can be designed freely to suppress the Moire fringes. The opening ratio and other parameters can be altered freely to achieve transmission higher than the conventional surface-metallized fiber mesh (Table 1).
4) When used in the front of a display, the thin film (2~4μm) does not reduce the viewing angle. (The thickness of the conventional surface-metallized fiber mesh equals to twice the fiber diameter, which reduces the viewing angle, lowers visibility when viewed diagonally, and tends to cause the Moire fringes.)

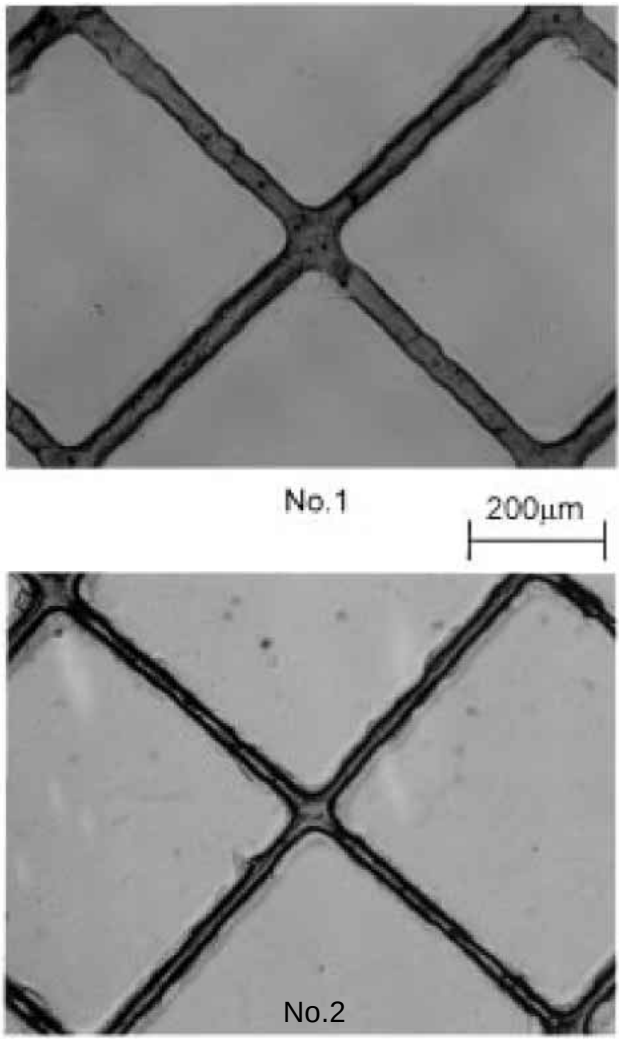

Photo 1 Microscopic image of the high-transparency and high-conductivity film

Table 1 Typical designs and characteristics of the high-transparency and high-conductivity film

No.	Pattern	Pitch (μm)	L/S (μm)	Substrate	Sheet Resistance (Ω/□)	Transmittance (%)
1	Square Mesh	500	40/460	PMMA Plate	0.48	80.1
2	Square Mesh	500	30/470	PET Film	1.25	82.3
3	Square Mesh	300	40/260	PET Film	0.15	70.3
4	Square Mesh	400	35/365	Glass Plate	0.95	77.9
5	Hexagon Mesh	400	40/360	PET Film	0.33	71.8

5) The conductive area has a black lining to suppress the reflection of external light.
6) The surface of the conductive area (metal layer) can also be blackened.

3. Characteristics of the High-transparency and High-conductivity Film

1) Surface resistivity of 0.1 to several ohms/□.
2) Total transmission of over 70% (variable by film structural design).
3) Electromagnetic shielding performance of over 35dB in 1~1000MHz range (Fig. 2).

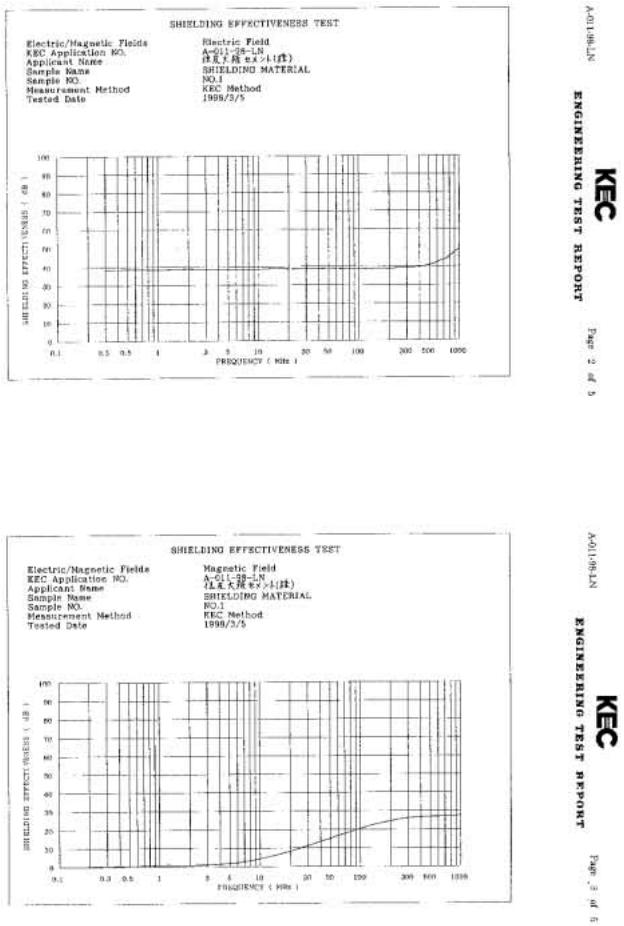

Fig. 2 Electromagnetic shielding performance (by KEC) of the high-transparency and high-conductivity film

4. Main Applications

1) Electromagnetic shielding for various electronic displays (especially ideal for PDP and FED that emits strong leakage electromagnetic wave in high frequencies).
2) Transparent electrodes in electronic devices.
3) Wiring in electronic devices