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Capacitance of transparent sputtering carbon thin film on transparent metaphase alumina on a flexible PET film

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ABSTRACT

A transparent sputtering-deposited carbon thin film was grown on transparent conducting metaphase alumina on a PET substrate and was covered with SiO_2 to form a device, which was investigated for electrical capacitance on a nanoscale field. The status of transparent metastable Al patterns is vital for nanocarbon deposition. The intersection of two straight Al line can be used to determine the locations of electrical signals for measurements in applications such as capacitive touch panels. Film thickness, spacing, voltage, resistance, current, and light transmittance were measured. In this paper, PET was used as the substrate and alumina metal was sputtered as the transparent conducting electrode.

1. INTRODUCTION

There are several method to use touch panel and are described as follows [Pepper, 1981; Blouin, 1999]. Surface capacitance is set in four corners of the sensor electrode, the application of voltage to form a uniform electric field, the use of finger touch caused by grounding and calculate the touch position, the surface capacitance can only make a single touch action.

Projected capacitive touch technology to capture the electrode through the capacitance changes between the touch position detection, and the original fixed in each ITO electrode between the electric field will be part of the power line connected to the finger skin and change. The capacitance of the X and Y axes on the control panel. As the distribution of the electric field cast, so we called the finger and the electrode between the induction capacitor for projection capacitor as shown in Fig. 1.

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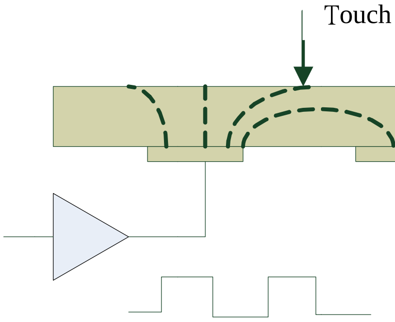

Fig. 1 Projected capacitive touch technology to capture from the electrode.

Resistive touch panel is mainly composed of two groups of ITO conductive layer from the upper and lower. The use of pressure to the upper and lower electrodes conduction, resulting in resistance changes and to get the contact point position.

Capacitive touch panel is the use of the arrangement of the transparent electrode and the human body between the electrostatic combination of capacitance changes generated to detect the coordinates as shown in Fig. 2 and Fig. 3.

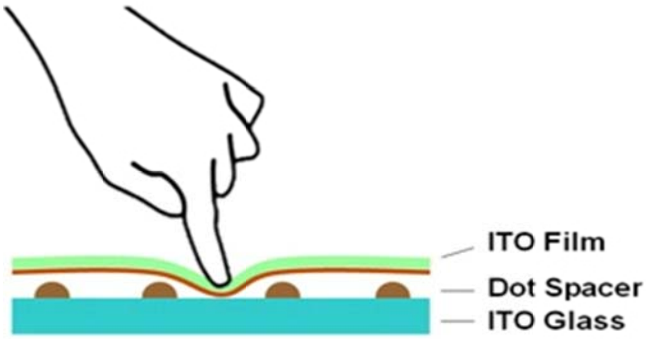

Fig. 2 Use of the arrangement of the transparent electrode for capacitive touch panel.

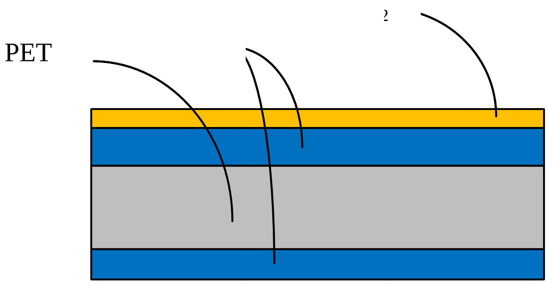

Fig. 3 Deposition structure of Capacitive touch panel

Those techniques most used materials of ITO and related materials. In this experimental, carbon is choice for capacitance inducer. Carbon can be two main bonding, sp2 and sp3. Carbon can be graphene in ultra-thin film and to be transparent.

With increasing the thickness, graphene will change to sp2 and sp3, depending on the nucleation of matrix. In this paper, the transformation is revealed on Al matrix, which is also transparent in nanoscale.

2. Experimental

Sputtering is a thin film deposition method using sputtering principle. Sputtering principle is to have the kinetic energy of the particles hit the surface of the target atoms, due to kinetic energy conversion, leaving the surface atoms escape. In this experiment, a DC sputtering is used for deposition of Al and a RF sputtering for deposition of C and SiO_2 .

3. Results and discussion

The resulted samples are shown as Fig. 4. The carbon exhibited partial sp2 and sp3 bonding. The time for the deposition of graphite-carbon sputter was crucial. Consequently, if in doubt, please refer to similar studies. The carbon did not belong to graphite. Our findings indicate that metal can exist in a transparent metastable phase at the nanoscale for several hours. Graphite is sputtered on top of a metastable Al thin film and acts as weak electric dipole. The electric characteristics of this type of graphite include capacitance.

Fig. 4. Deposition time for 45 secs and divided with a spacing 4 mm of pet film.

Fig. 5 shows the transmittance of samples for different time. The transmittance increases with decreasing the thickness of the deposited time. The thickness increases with time, so the absorption increases. The transmittance decrease largely with small increase of thickness. At the time of 60 secs, the transmittance decreases about >5.8 %. At the time of 75 secs, the transmittance decreases more down to >8.9%. This means that the thickness determine the transmittance dramatically.

The light transmittance also increases with the wavelength. Especially blue light causes more adsorption than red light. The discrepancy became larger at heavy thickness. Short deposition time, for example, at 45 secs, causes the even transmittance than those of longer deposition time. At the time of 60 secs, the transmittance 0f blue light decreases ~ 10.7%. At the time of 75 secs, the discrepancy increases to ~23.1%. It demonstrates that blue light absorbs at wider thickness. The nano thin film is low adsorption and more even with the wavelength of light.

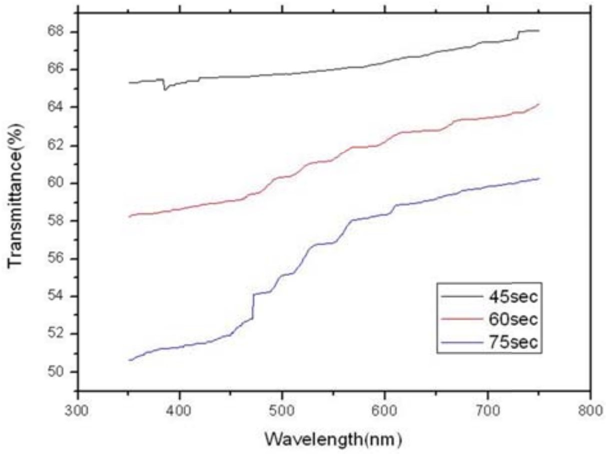

Fig. 5 Transmittance of samples for different deposited time.

4. CONCLUSIONS

This study has successfully produced PET/Al/C/Al/SiO_2 flexible capacitive sample. The transparency of the samples is related to the thickness of the deposition. On a transparent scale, the deposition of carbon on Al caused a metastable phase reaction that lasted for a period. The film thickness will change due to the sputtering time. The thicker the thickness of the sputtering process, the transmittance decreases.

REFERENCES

Pepper W. (1981), Touch panel system and method, United States Patent 4,293,734.
Blouin F., (1999), United States Patent 5,977,867.