

DKN Research Newsletter

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Sputtering or Chemical Plating?

More than twenty years ago, material manufacturers were competing with each other to develop adhesiveless copper clad laminates for the next generation flexible circuits. A dozen or so companies were leaders in the pack with their new technologies. These technologies were categorized two types: casting/laminating process, and a metallization of polyimide films.

The casting/lamination process used couple of polyimide resins coated on copper foils and baked to form a reliable base layer. Next, a second copper foil was laminated on the other side of the polyimide layers. The process provided reliable bond strength between base film and copper, but the manufacturing process was complicated, and the cost was relatively high.

Metallization of the polyimide film required the production of a seed layer before electrical plating. The two choices to produce the thin seed layer were a sputtering in a vacuumed chamber or electroless plating in a wet bath. The sputtering created reliable bond strength, but the process is slow and expensive. Electroless plating is a simple process and it provided a low cost solution, but unstable bond strength was an issue.

There was no perfect manufacturing process; each had advantages and disadvantages. At the time, I was a project leader for a manufacturer of casting type adhesiveless laminates. The manufacturing facility was sub-par, and did not have enough capabilities to satisfy customer's requirements. I needed to change our business strategy. First, I reorganized the R&D engineering staff to focus on engineering services for small volume customers who required high end applications. Simultaneously, I required our process engineers to improve quality and yields. The strategy was successful! We acquired strategic customers with high volume applications and increased our margins. Our products became the industry standard.

The metallized laminates with sputtering did not garner much support in the flex circuit industry. It is still popular as a special application for driver IC modules in flat panel displays. The modules require very fine traces; accordingly

they demanded very thin copper foils. The devices were inexpensive and the market grew rapidly. The sputtered laminate became the industry standard.

Unfortunately, metallized laminate with electroless plating was not successful even though the process was inexpensive. Manufacturers could not improve the bond strength significantly enough, and the process is no longer used in the industry.

I developed a new metallization processes comparing sputtering and electroless plating for medical devices. Both technologies improved significantly over the last ten years. They have different advantages, and I use them depending on the application. They are capable to metallize on polyimide films as well as new exotic materials such as rubber sheets, paper, cloths and more, and are a comfortable dielectric material for wearable electronic devices.

Can the metallization processes generate a new flexible laminate business for wearable devices? Absolutely! Feel free to reach out to DKN Research for a collaborative project centered on wearable electronics.

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Headlines of the week

(Please contact haverhill@dknresearch.com for further information and news.)

1. ELIYY Power (Battery manufacturer in Japan) 11/26

Has developed a new lithium ion batter with non-flammable ion liquid.

2. AIST (Major R&D organization in Japan) 11/28

Has developed a new anode material of SiO deposited by vacuumed evaporation for lithium ion batteries. It makes battery capacity 5 times larger compared to the traditional graphite anode.

3. NTT (Major telephone company in Japan) 11/29

Has demonstrated a prototype model of flexible and transparent secondary battery for IoT applications.

4. AGC (Major glass product supplier in Japan) 11/30

Ha developed a glass base transparent antenna for 28 GHz band 5G telecommunication targeting windows of automobiles and buildings.

5. JAE (Major connector manufacturer in Japan) 12/5

Has rolled out a new waterproof connector series “MX60A” for engine room use of the automobiles. The pin counts can be up to 177.

6. DaiShinku (Vacuumed equipment manufacturer in Japan) 12/5

Has developed the industry smallest size quartz device with embedded temperature sensor in the package. Package size: 1210 (1.2 x 1.0 x 0.5 mm)

7. Toshiba (Major electric & electronics company in Japan) 12/6

Will roll out new compact 3.5” HDD with 14 TB capacity for consumer applications in next February.

8. Yasukawa (Major robot manufacturer in Japan) 12/7

Has unveiled its new manufacturing plant “Yaskawa Solution Factory” with various IoT technologies. The productivity will be three times higher, and the lead time will be one 6th.

9. Ricoh (Major electronics company in Japan) 12/10

Has been introducing “New Deep Learning Process” for robotics using GAN (Generative Adversarial Network). It imitates actions of human beings.

10. Takenaka (Major construction company in Japan) 12/10

Has been introducing drones to check the progress of the constructions in the limited space in high density building areas.

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