PANEL PROCESSING – WHEN SIZE MATTERS !

LAYERS UPDATE

It's already a year since Evatec's market introduction of the PNL 500 panel level processing tool to the Advanced Packaging market. Process Engineer, **Johannes Weichart** gives us an update on capabilities and performance levels of the latest tools off the production line as customer process demands and production cost targets get even tougher for 2019 and beyond.

The PNL 500 proves itself

The PNL 500 tool already proved itself over the last 12 months in customer production lines as well as working as a sampling platform for future customers in Evatec's own Advanced Packaging Competence Centre (APCC). Important product quality criteria like good contact resistance performance, adhesion, yield and reliability could all be achieved on various customer substrates for the Fan Out Panel Level Packaging (FOPLP) or the advanced Printed Circuit Board (PCB) markets.

Our approach of static processing has met and exceeded our expectations.

1. While other suppliers chose solutions with moving sources to achieve high uniformities, Evatec decided against this approach to keep the particle count at an absolute minimum and allow for more efficient cooling of substrates. Particles bigger than 2.5µm are in the low two digit regime on the full panel.
2. The newly developed dual frequency CCP etch source reported in last years LAYERS enables full face etching either with a clamped substrate or also clamp-less, depending on customer needs. We could also improve etch uniformity and rate over the last year as shown in figure 1 – although applicable rates do of course depend on the substrate to be processed and its heat dissipation characteristics.
3. Similar improvements could be achieved for the PVD sputter source. Evatec's concept of using rotary cathodes over a stationary substrate has several advantages including a very low CoO due to low target costs and high target utilisation (~80%), easy maintenance and very efficient target and substrate cooling for best product results. With further advances in magnet design and processing know how, uniformities and rates could also be improved significantly as shown in figure 2.
4. Advanced control capabilities on our tool like prevention of arcing / plasma damage are also key to achieving the best process yields. The process sources have already proven in the field that long term production is possible without processing errors.

The PNL 600 is on its way

Due to growing demand in the panel market for even bigger substrates, Evatec will soon have solutions ready for exactly that. The next generation PNL 600 will allow processing of panels with a size of more than 600mm and be based on the same process technologies as the ones proven for the PNL 500 tool. But bigger definitely doesn't mean slower, and the new tool will also have processing capabilities of more than 20 panels / hour.

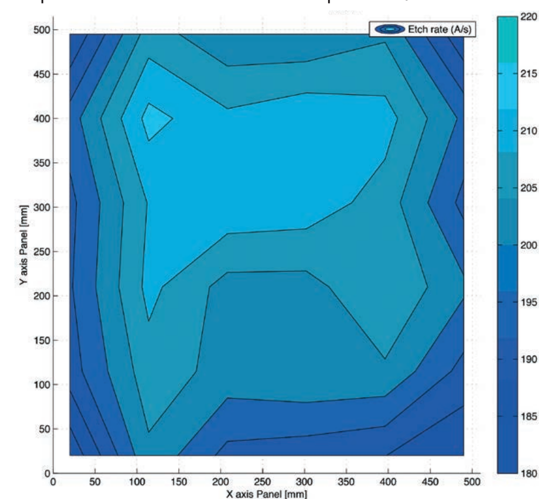

Fig. 1: Etch rate (SiO_2 etching) and uniformity on a glass test panel. SiO_2 etch uniformity, mean = 201.15 Å, Sigma 1 = 4.68, Unif $_{Max,Min}$ = 8.85%. Rate = 1.68 Å/s

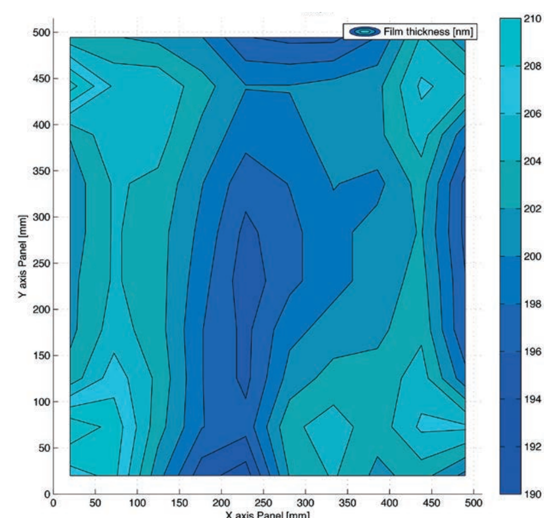

Fig. 2: Uniformity of the copper layer. Cu film thickness, mean = 201.30 Å, Sigma 1 = 1.83, Unif $_{Max,Min}$ = 4.60%. Resistivity: 2.58e-8 Ohm m