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# Technology 008: Hybrid Metal Polymer Adhesiveless Thin Film

This technology is a method to directly bond copper films to polymer film substrates used to produce flexible printed circuit boards (FPCB), chip on film (COF) and ball grid array (BGA). This new proprietary wet method modifies polymer films enabling direct bonding of a very thin 1 – 4 micron layer of copper or nickel, eliminating the need to use traditional acrylic adhesive layers.

- Approximately half the thickness of films produced with current technologies—provides one of the smallest flexible circuit board footprints.
- Etch more traces in less space for very fine circuit patterns. Current copper circuits are spaced approximately 100um apart. This hybrid metal polymer thin film is capable of etching circuits just 30um apart.
- Reduce copper film layer to 1 - 4 microns. The thinnest copper film achieved in production by industry leader Dupont for similar adhesiveless products is 5 microns. Average similar adhesiveless film layers are 5 - 18 microns.
- Opportunity for roll to roll circuit printing applications.
- Innovator states it is capable of making 2-Layer flexible copper clad laminate (FCCL), which can be etched to the base film materials for COF or FPCB having less than 30um of fine pitch width (Line/Space = 15um/15um).
- Improve board performance.

## Economics:

- Reduces material costs by as much as 30-50%.
- Speed of production can be increased from 1 meter per minute to 4 meters per minute.

## Development Status:

- Early stage technology. Bench model exists, however $500,000 to $1 million needed to advance to a working prototype.
- Expects 6-12 months for BT laminate/Cu structure and 1-year for LCP laminate/Cu structure.

## Intellectual Property Status:

- ELECHEM Co., Ltd. has filed for global intellectual property protection in Korea, Japan, China, and the United States.

## Competition:

- Four major manufacturers of “adhesiveless” FCCL are film producers DuPont Electronics, Rogers Corporation, Parlex, and Multek Flexible Circuits.
- Sputter Deposition is the only other adhesiveless film production process capable of 1 - 4 micron layers, however it must be performed in a vacuum chamber large enough to have roll to roll processing.
- The innovator’s proprietary wet method is an atmospheric technology that offers cost and time advantages over vacuum chambers.
- This wet method easily employs web conversions or roll to roll processing, a necessity for high yielding factories with linear production lines.

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