Fraunhofer ENAS

FRAUNHOFER INSTITUTE FOR ELECTRONIC NANO SYSTEMS ENAS

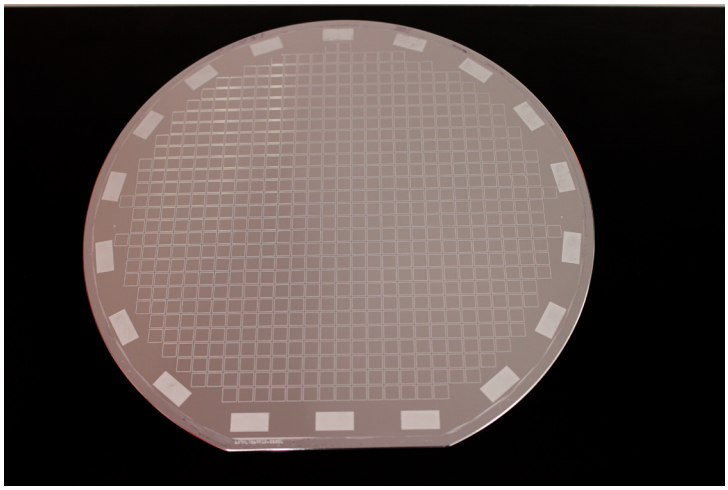
PRESS RELEASE

Thick Aluminum Layers for Assembly and Packaging Technology

At the SENSOR+TEST 2019, Fraunhofer ENAS introduces an electroplating process to manufacture thick aluminum layers on up to 150 mm substrates

Within a public funded project (AioLi BMBF-FKZ: 16ES0329K), the Fraunhofer ENAS developed a deposition process of thick aluminum layers on various substrates, like silicon, printed circuit board or ceramics. Due to the negative standard potential of aluminum, the electrodeposition is carried out in an ionic liquid instead of water-based electrolytes. With this method, it is possible to deposit aluminum layers up to 30 µm on 6-inch substrates. The wafer-level coating is therefore unique in the world.

The patterning is done using pattern plating through a resist mask. After the deposition, the seed layer is etched and the patterns are electrically isolated. The layers can be used as conductor paths, heat management, bond pads or bond frames for chip and wafer-level bonding. The electrical properties of galvanically deposited aluminum correspond to those of bulk material to 87 percent. Thus, the properties of the electroplated aluminum are 10 percent better than those of aluminum layers deposited from the gas phase.



150 mm silicon wafer with aluminum bond frames for Al-Al thermo-compression bonding on an aluminum seed layer. Photo © Fraunhofer ENAS

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Further research and development work is focused on the long-term goal of using galvanic aluminum in both printed circuit board technology and semiconductor technology. Due to its material properties, aluminum is a good alternative to copper in printed circuit boards. In microsystems technology and microelectronics, aluminum is established as final metallization. A homogeneous material system would therefore be feasible with the help of ultrasonic flip chip assembly using aluminum pillars (instead of tin bumps).

The next steps will therefore address assembly and interconnection technology on aluminum surfaces and the coating of topographies, such as through-holes or blind holes, in the printed circuit board and on semiconductor substrates. The scaling of the process to 8-inch wafers or larger rectangular substrates is also being considered. To achieve this, a lot of engineering work has to be done in terms of plant technology in order to scale from laboratory equipment to industrial plants.

For the further development steps, the Fraunhofer ENAS is looking for interested companies, which are interested in a cooperation in the field of electroplated aluminium or just identified an application scenario for the electroplated aluminum. Furthermore, the deposition can be adapted as a service on customer-specific substrates with regard to size, material, seed layers, etc.

At the Fraunhofer joint booth in hall 5 (No. 248), Fraunhofer ENAS will present the process and possible applications of electroplated aluminum.

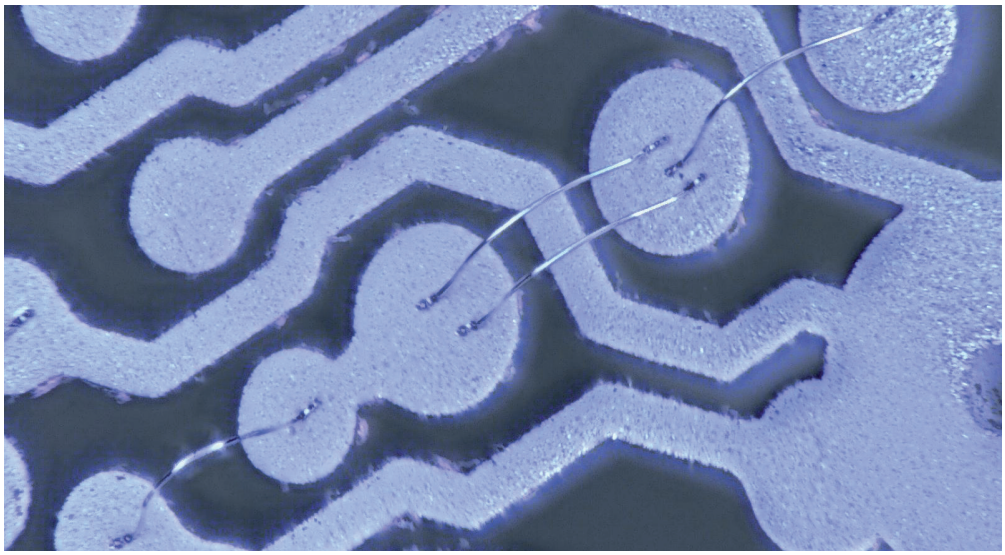

Image by oblique light microscope shows aluminum pattern with four 18 µm wire bonds.
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