Forschungsinstitut für Mikrosensorik GmbH

Failure Analysis of Wire Bonding on Strain Gauge Contact Pads using FIB, SEM and Elemental Mapping

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Motivation

- Stacks of titanium, platinum, and gold layers - a popular metallization system for bond pads.
- Wire bonding after pressure sintering at,e.g.,875 °C, bonding failures must be identified and analyzed.
- Applications: Wire bonding on strain gauges for force sensing.

Strain Gauge

- 500 x 500 x 15 micron strain gauge integrated within ceramic by pressure sintering (Fig. 1).
- 450 nanometer of titanium, platinum and gold acting as bond pad metallization (Fig. 2).
- No obvious barrier at the surface of contact pads during the bonding process.

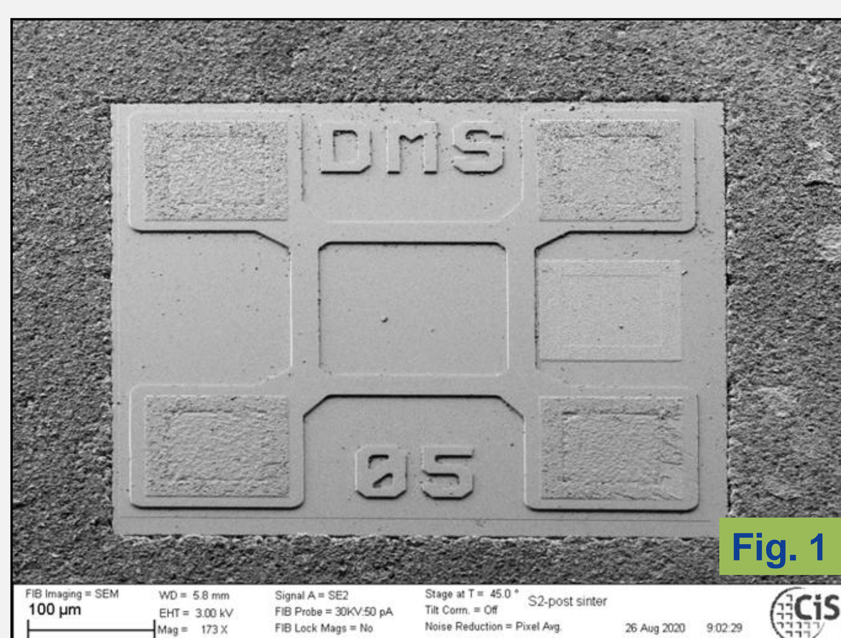

Fig. 1

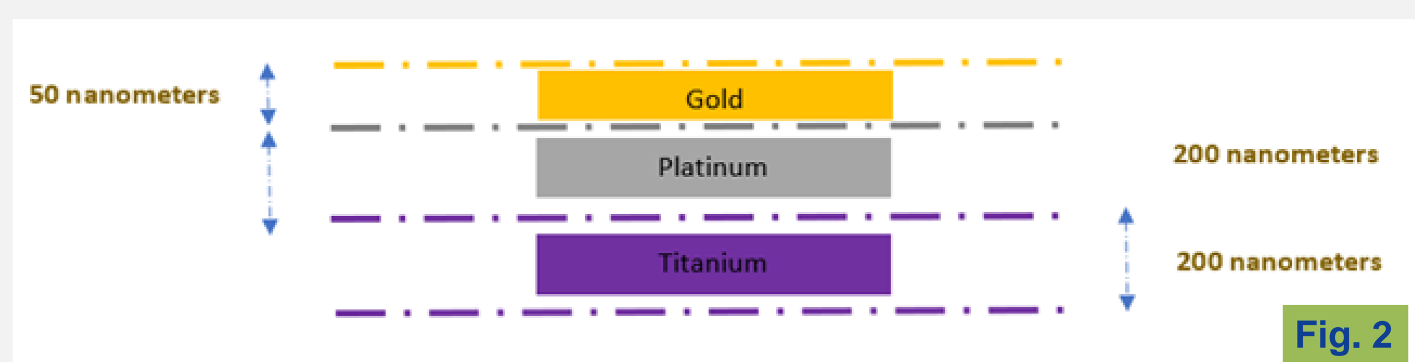

Fig. 2

- Height difference of 1.932 micron on corner contact pads and .179 micron on centre contact pad.

Summary and Conclusion

- Wire bonding post sintering of 875 °C is not feasible due to infusion of metallization layers.
- Additional metallization layer at top can aid in bonding.
- Removal of height difference during etching process can support in bonding.
- Alternatively, screen printing process can be utilized as interconnect methodology.

FIB, SEM and EDX

- FIB cross sectioning is performed on a 10 μm^2 area on contact pads (Fig. 3).

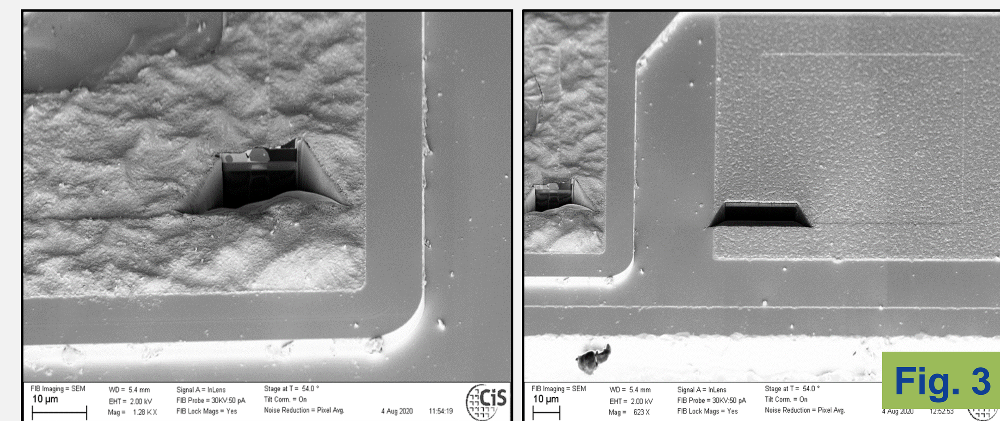

Fig. 3

- FIB cross section combined with EDX elemental mapping for centre contact pad (Fig. 4).

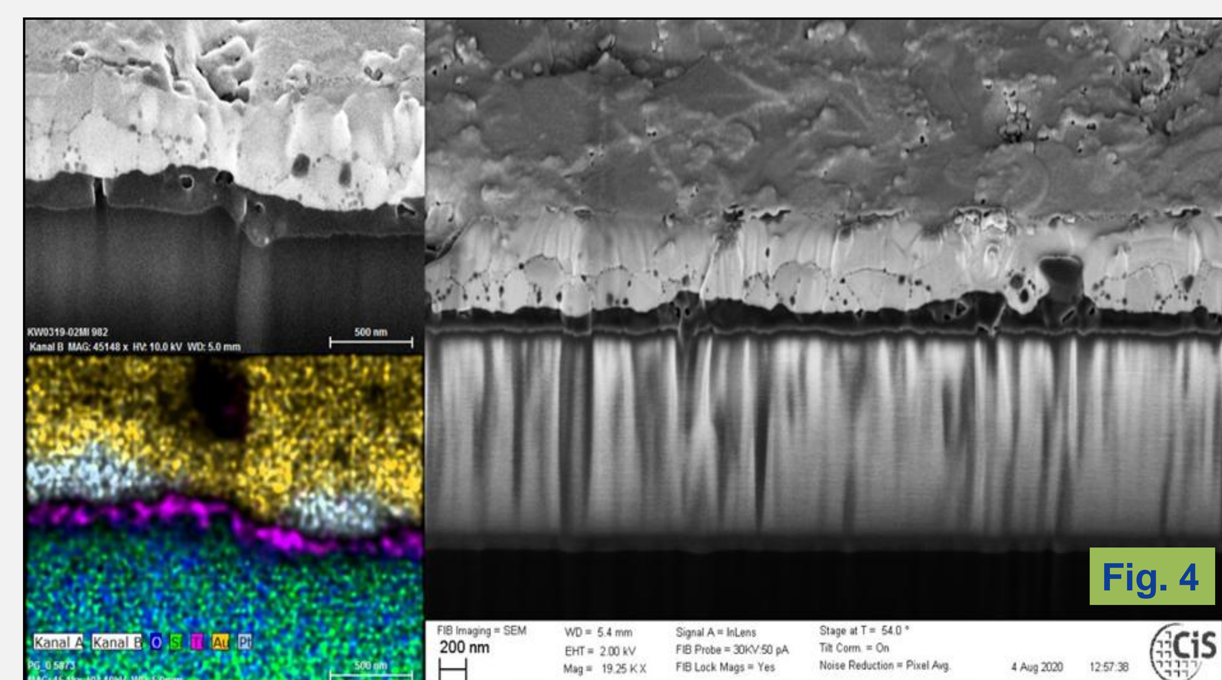

Fig. 4

- Titanium, platinum and gold layer segregation is observed.
- No overall agglomeration is observed.

Analysis

- Agglomerate formation for corner contact pads.

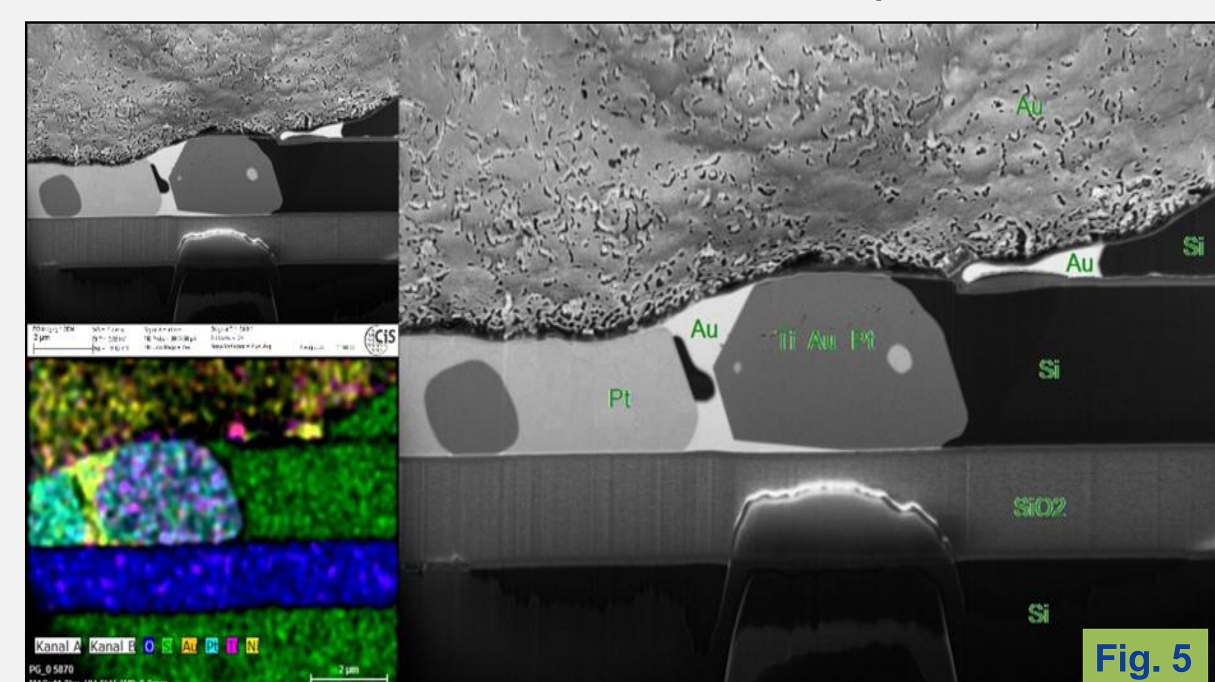

Fig. 5

- Stress accumulation at height difference forces the metallic layers to form agglomerate at interface.
- Platinum is diffusing at top gold layer surface.

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