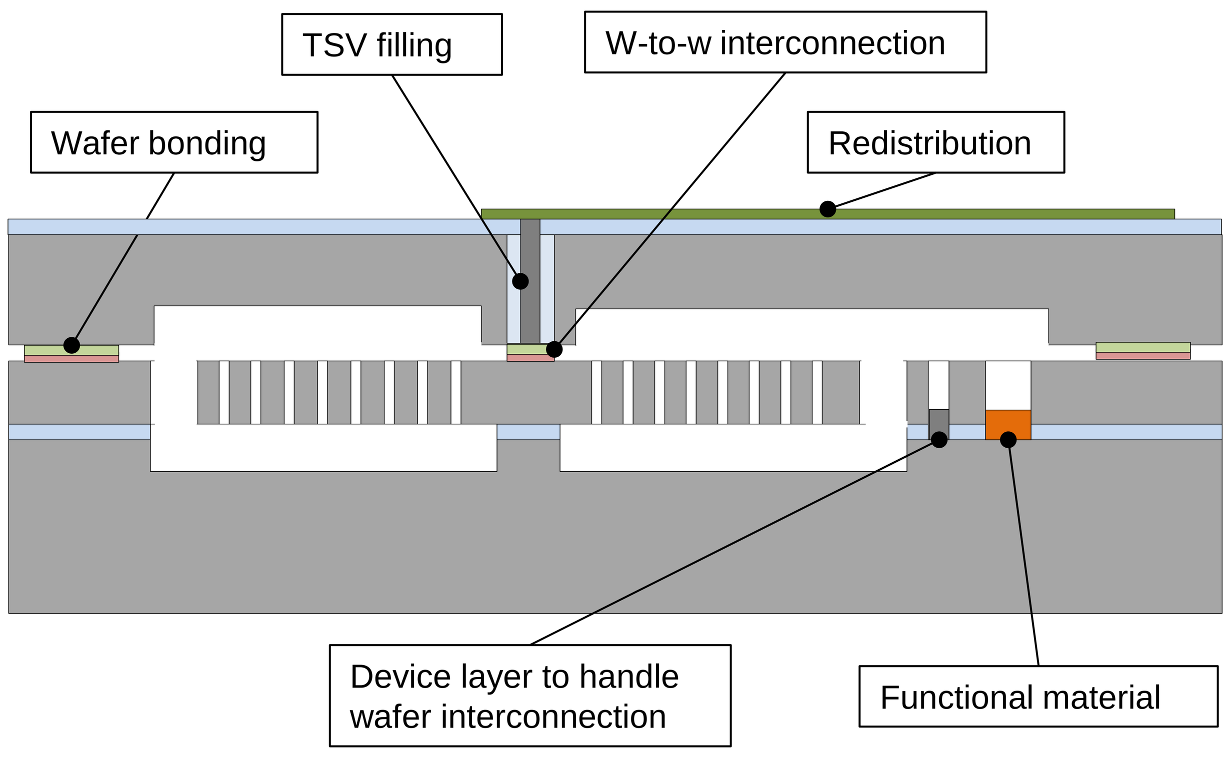
PROMINENT

Processes for MEMS by Inkjet Enhanced Technologies

General description

Printed electronics achieved recently considerable progress due to new printing technologies and to the introduction of nanoparticle inks, paving the way towards integrating its capabilities within the silicon-based nanoelectronics. The objective of the ENIAC JU project PROMINENT is to demonstrate significant cost reduction in MEMS manufacturing by using printing technologies to reduce materials, chemicals and energy consumption, waste water production, processing cycle time and capital investments.



Goals / Objectives

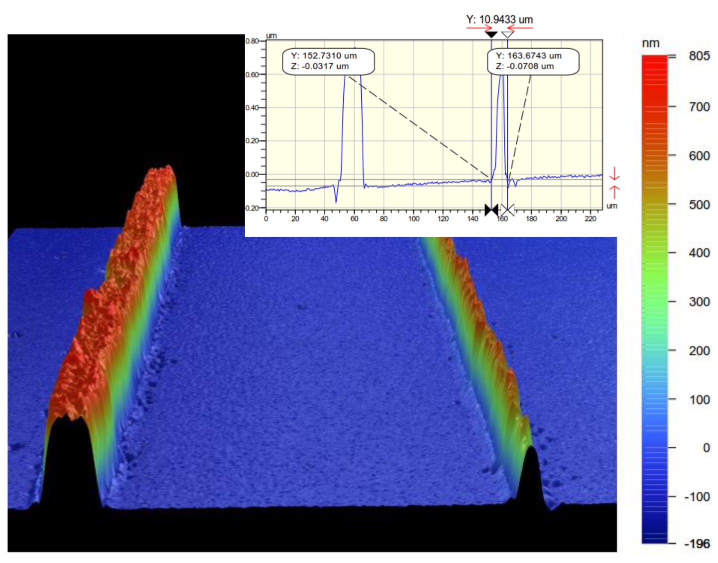
In particular, executing selected steps in the MEMS manufacturing using maskless, digitally controlled, localized additive processes instead of the incumbent subtractive processes will result in a greatly simplified process sequence. This will result in

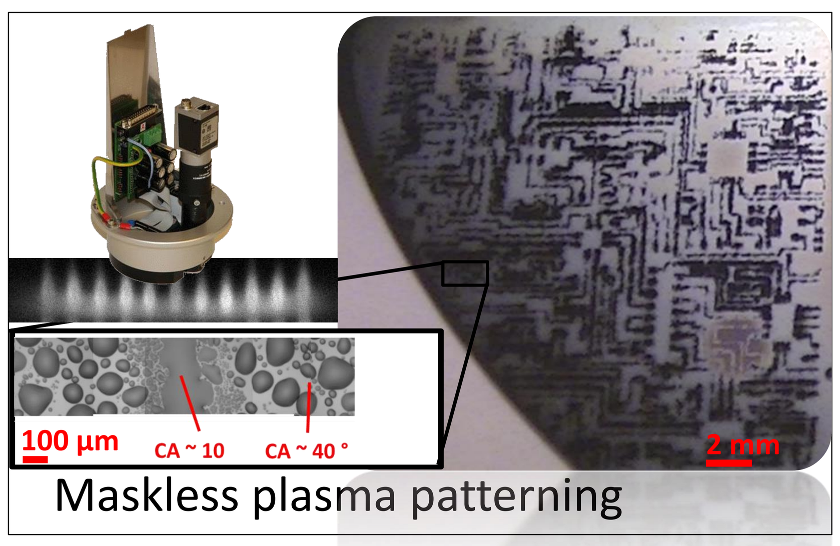
- lower initial investment costs for a MEMS line, making it easier for manufacturers to introduce new products
- new features in the MEMS devices, new application areas
- increased flexibility in production, allowing for smaller batches, mass customization and fast changes in the production process
- easier prototyping and shorter time-to-market period in new MEMS devices
- greatly reduced production costs and environmental impact

Societal impact / Results

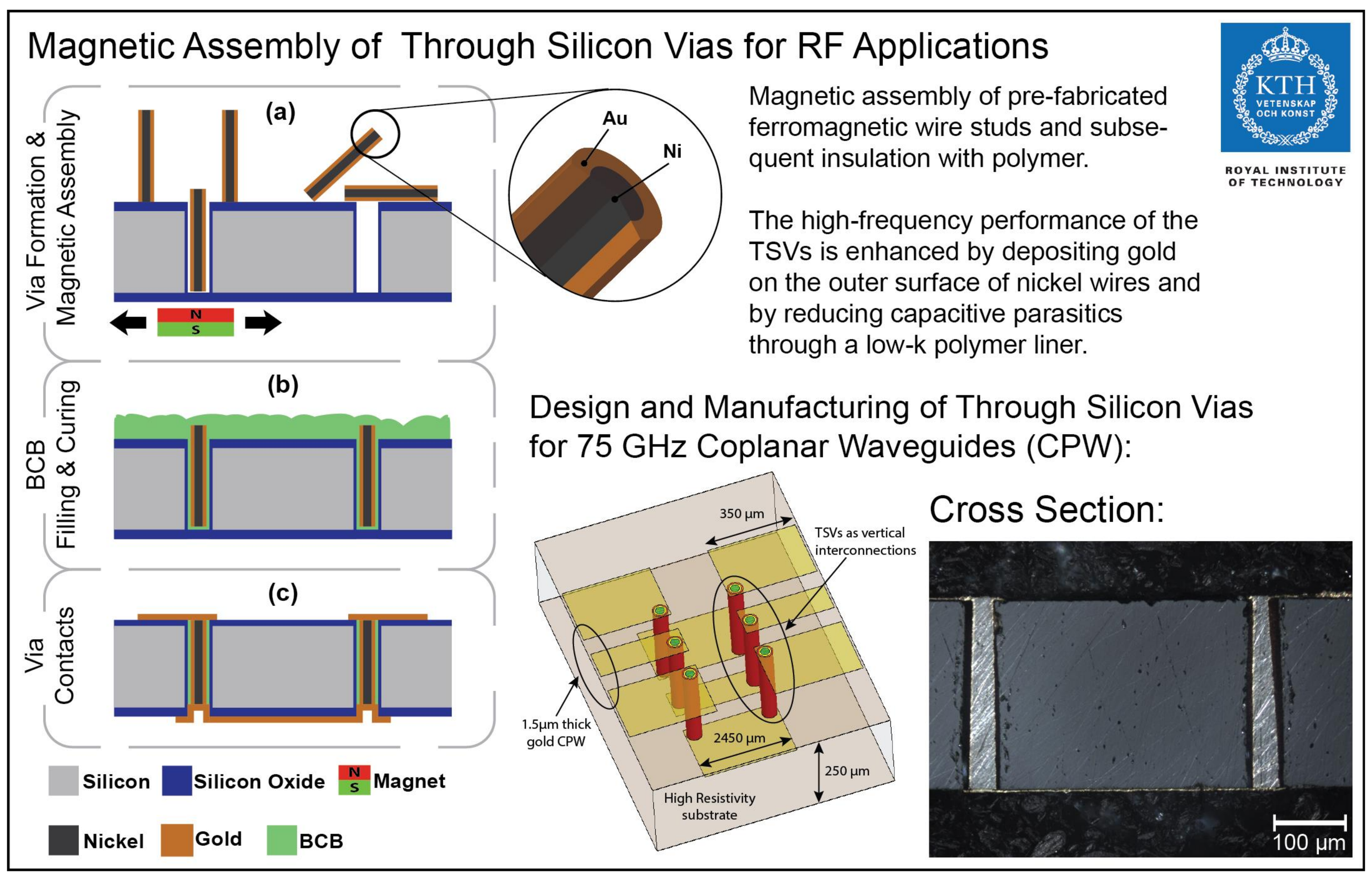
The project has, for example, investigated the suitability of inkjet printing in TSV and RDL fabrication, developed and commercialized digital plasma printing for semiconductive substrates, developed laser sintering technology for Cu-nanoparticles on top of silicon wafers. Further development is made with magnetically assembled TGV.

Maskless plasma patterning technology has been developed by InnoPhysics B.V. for silicon wafer surface treatment. Digital bitmap patterns can be plasma printed directly onto the wafer surface for improving ink adhesion and printability. By adding precursor gases to the plasma mixture, different chemical functionalities can be deposited.





Maskless plasma patterning



Partners

- Okmetic, Markku Tilli
- Murata Electronics , Heikki Kuisma
- Tampere University of Technology, Matti Mäntysalo
- Spinverse , Pirjo Pasanen
- Silex, Thorbjörn Ebefors
- KTH Royal Institute of Technology, Andreas Fischer
- Mycronic, Gustaf Mårtensson
- InnoPhysics , Alquin Stevens
- poLight, Jon Herman Ulvensøen
- Nanium , Jose Campos

Countries involved

- Finland
- Sweden
- Netherlands
- Norway
- Portugal

Additional information

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- B. Khorramdel, M. Mäntysalo, "Inkjet Filling of TSVs with Silver Nanoparticle Ink", In Proc. of ESTC, Helsinki, Finland, Sept. 16-18, 2014
- S. J. Bleiker et al., "High-Aspect-Ratio Through Silicon Vias (TSVs) for High-Frequency Application Fabricated by Magnetic Assembly of Gold-Coated Nickel Wires," IEEE Transactions on Components, Packaging and Manufacturing Technology, accepted, 2014
- P. Ågren, et al., "3D MEMS Wafer Level Packaging Exemplified by RF Characterized TSVs & TGVs and Integration of Bonding Processes", in IWLPC'2014 proceeding, Nov. 11-13, 2014, San Jose, CA

Project leader: Markku Tilli
Company: Okmetic Oyj
Email: markku.tilli@okmetic.com
Tel.: +358 9 502800

www.prominent-mems.eu
www.eniac.eu