fab2asm
from fabrication to assembly

SEVENTH FRAMEWORK PROGRAMME

Laser processing in 3D Integration of Heterogeneous Microsystems

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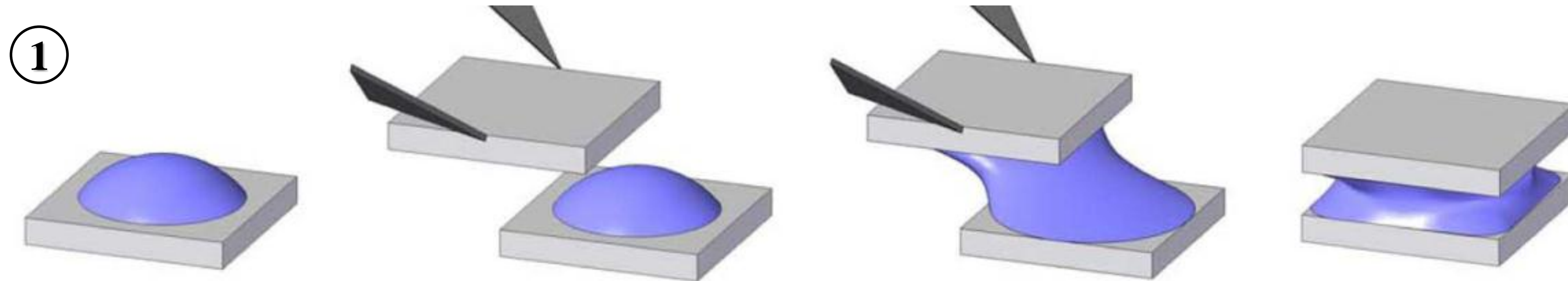
Introduction: Material processing using Ultra Short Pulsed Laser sources is an efficient and precise technology for 3D integration of heterogeneous microsystems. Within the framework of the FAB2ASM project, the University of Twente investigates multiple laser based processes, such as: laser created receptor sites for fluidic self-alignment, laser drilling and laser based deposition of metal droplets.

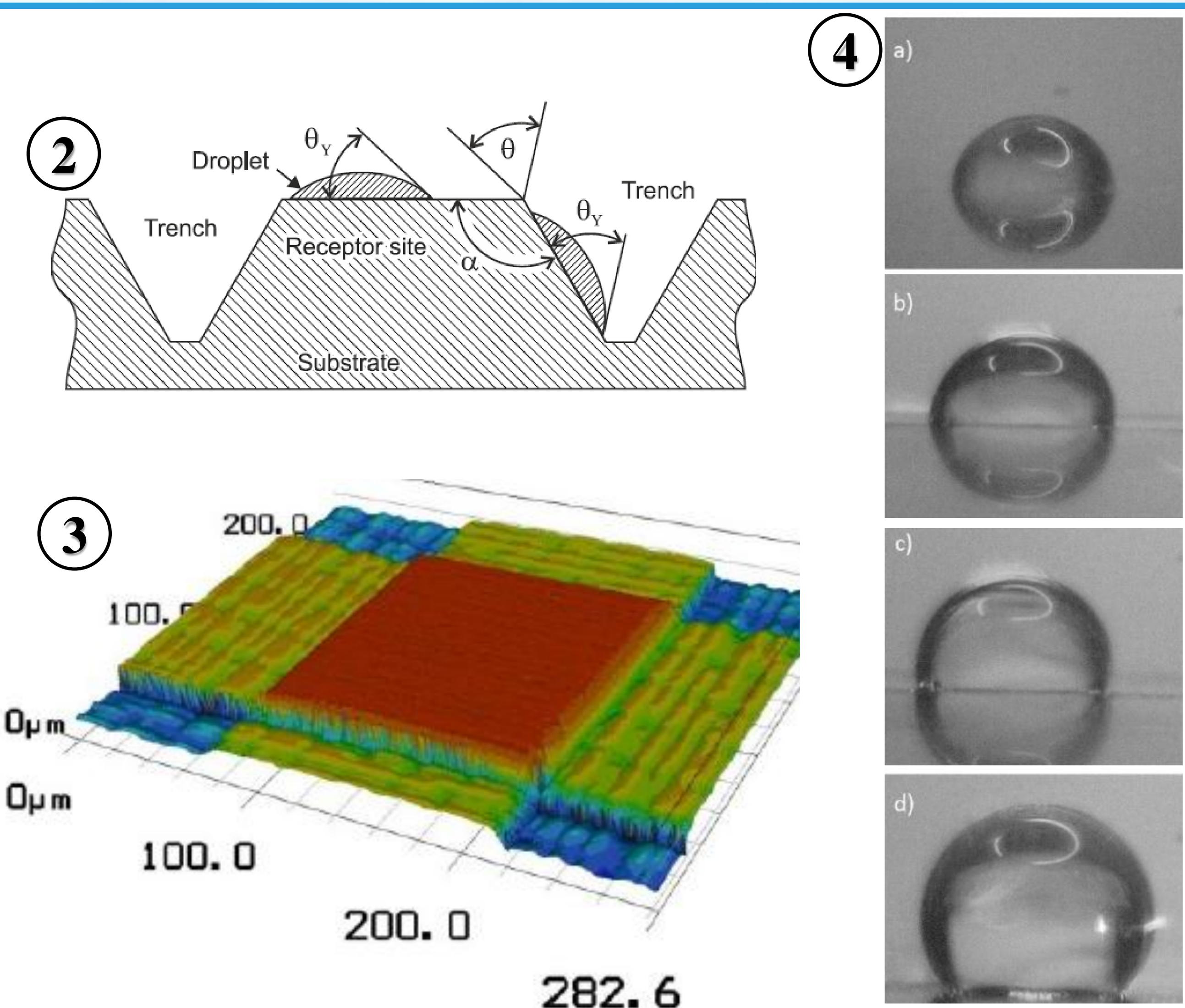
>>*Fluidic self-alignment*

The fluidic self-alignment process (**1**) is based on the restraining forces of a liquid i.e. surface tension, which allows the accurate positioning of two interfaces with respect to each other.

2+3: Among other possible concepts, sharp edges have been proven to be efficient receptor sites. In a first approach, these edges have been created using laser ablation.

4: Droplets pinned on different receptor sites, exhibiting different contact angles: (a) 68° (b) 90° (c)102° (d)127°



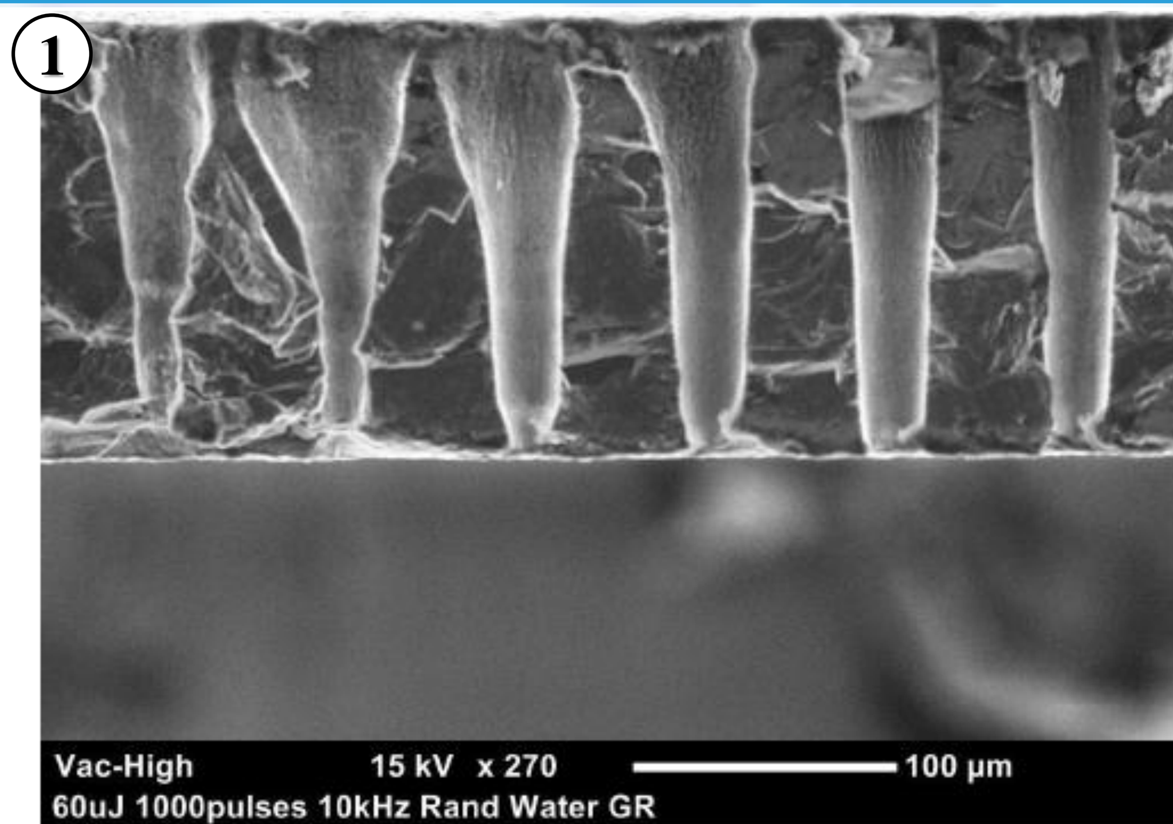


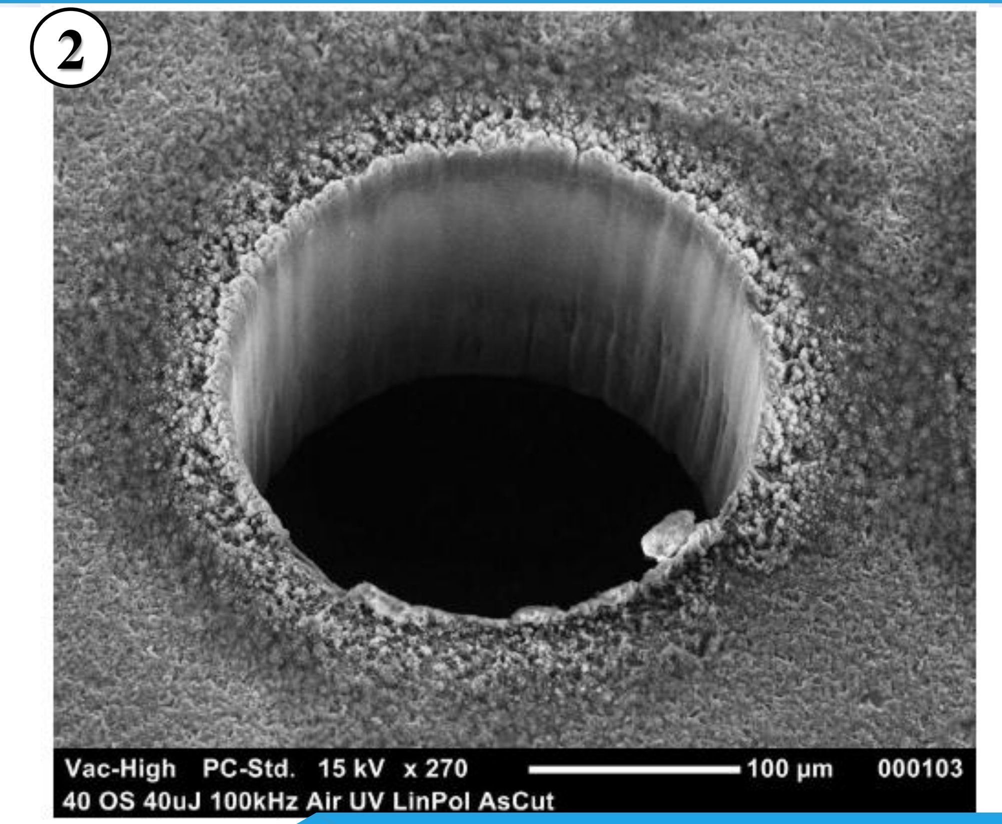
>>*Laser drilling*

Laser drilling is used to create Through Silicon Vias (TSV), that are needed for electrical internconnections.

1: SEM image of cross sections of holes drilled under a water film. λ=515nm 1000 pulses at 60µJ and 10kHz.

2: SEM image of the entrance side of hole drilled using helical drilling. Diameter of the hole is 250µm. Laser scanning speed 49mm/s, 40 overpasses, pulses at 40µJ and 100kHz.





>>*Laser-induced forward transfer (LIFT)*

The LIFT process (**1**) is based on an ablation process, which results in a deposition of various types of materials, mostly metals. It can be used for TSV filling and to print electrical interconnections. The setup consists:

2: Material that is to be transferred (*Donor*).

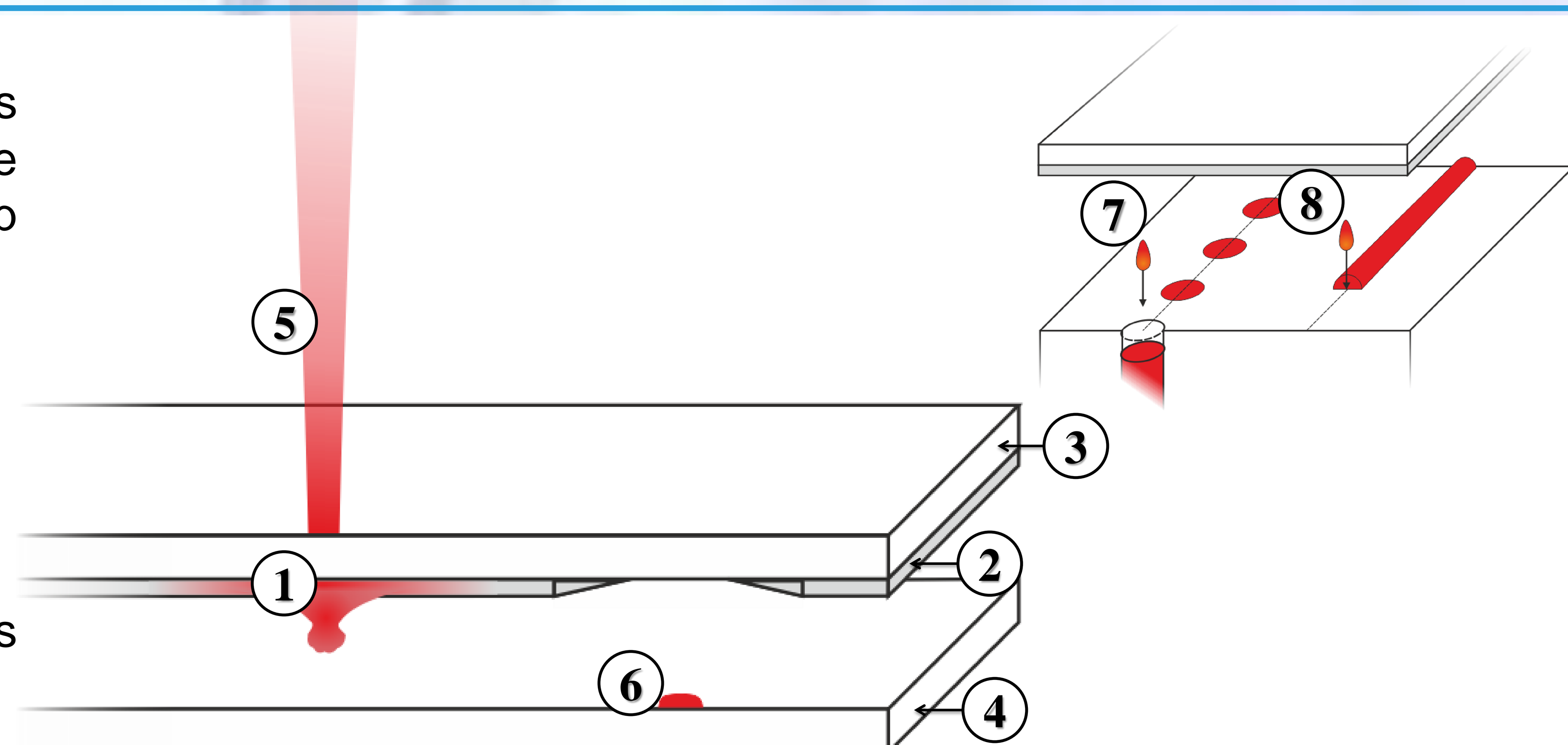
3: Transparent substrate on which the Donor is coated (*Carrier*)

4: The substrate on which the material is to be deposited (*Receiver*)

5: Focused pulsed laser beam.

6: Depending on processing parameters, single droplets or sprays can be transferred

7: LIFT used for TSV filling, and to print conductive lines (**8**)



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