Macro pleasure with Microprocessing Laser Solutions

the IN GLASS Technology leads the route to wafer based and efficient production of microsystems in photonics, microfluidics and MEMS for implants, thanks to USP-Laser processing and modified glass wafer handling

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INTRODUCTION

Ultra-short pulse (USP) Lasers have revolutionised the field of Microprocessing and are now being used in real production plants. However, the efficient production of glass chips in high volumes poses several challenges, not only with the USP-laser processes, but also with wafer handling, qualification, and metrology. Our IN GLASS technology at Yalosys AG is focused on overcoming these challenges and establishing a reliable and economic way to produce glass chips at high volumes.

METHODS

The IN GLASS Technology presented in [1], consists of 8 steps from design to the assembled glass chip. The core processes of dicing, welding and drilling in glass is based on the quickly evolving and revolutionising technology of USP-Laser machines, hence the route for 2.5D or 3D packaging is now open for the packaging of devices like hermetically tight and bio compatible implants, photonics integrated circuits (PIC), integration of micro-optics in MEMS, Sensors, VCSL, Lidar, etc.

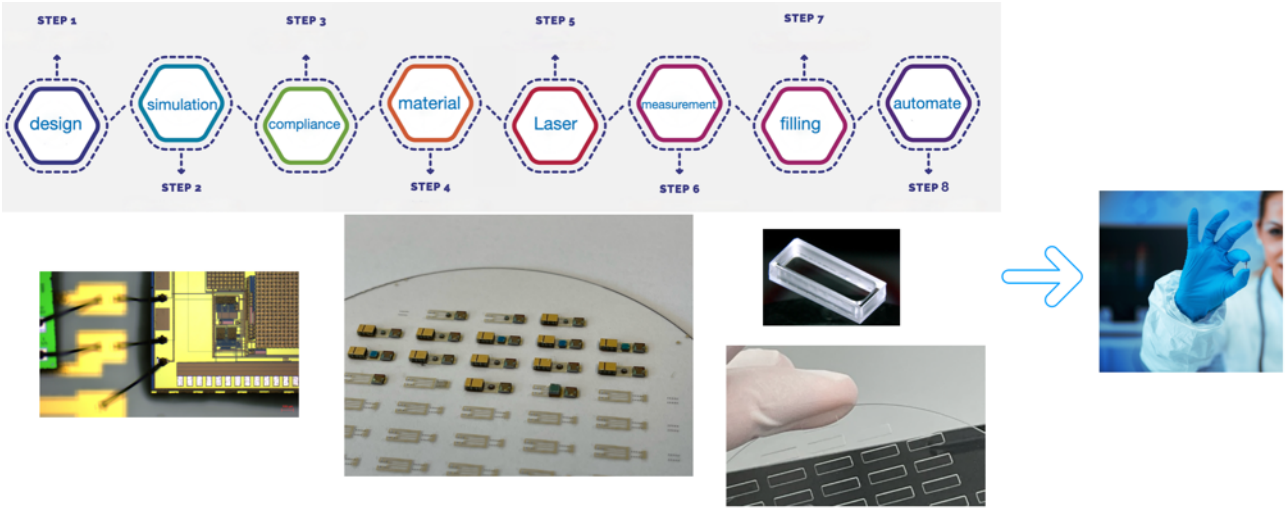

Fig. 1: USP-Laser Microprocessing Solutions allow new assembly processes

Two facts have come together that will enable to achieve the next quantum leap in miniaturisation:

1) The Laser Micro Processing Solutions of IN GLASS *dicing*, *welding* and *drilling* in a clean, high speed, efficient and wafer-based scale.
2) The Through Glass Via (TGV) technology [5] that enables also wafer scale manufacturing like a standard Si-wafer process.

This means that the “frontend” is coming to the “backend “, in wafer scale production. This paradigm change will generate new and improved packaging workflow.

Changing existing workflow is always cumbersome because it will need new investments in workflow and machinery, while other will drop away. To help the photonics and medical device industry, we have set up exactly this work flow to step in at small to medium volume production in wafer scale production and in appropriate clean room facility.

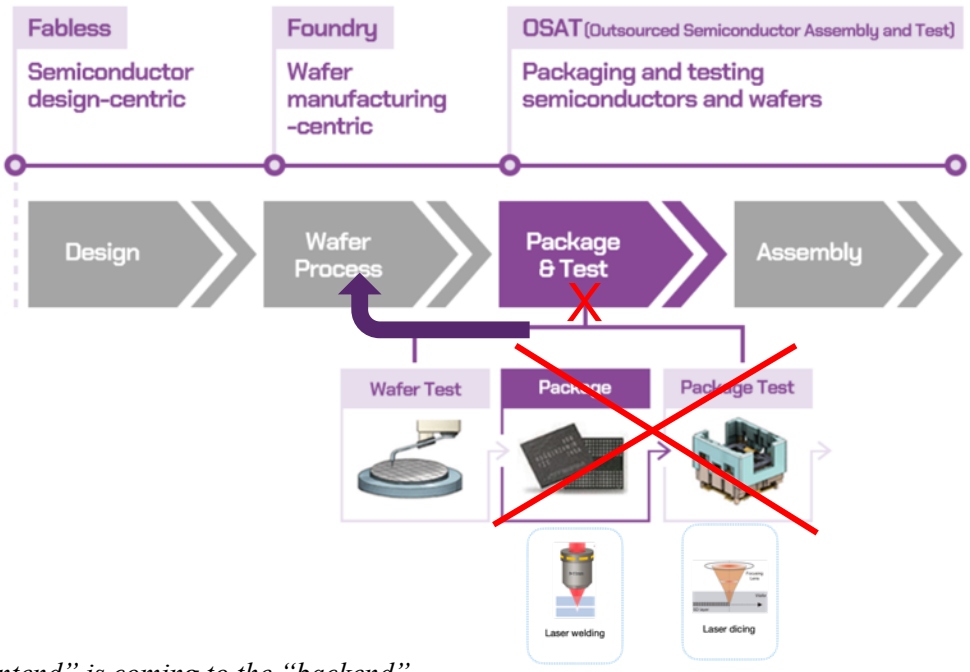

Fig. 2: “frontend” is coming to the “backend”

{Process picture and (conventional) definition from Suh Min-suk, technical Leader of PKG Development, SK hynix, Taiwan}

This development seems to be obvious, but is a strong change in work flow paradigm. It will enable established companies and service providers to massively improve their efficiency, however at the price of investing in new processes and new machine infrastructure. This is where Yalosys AG as specialized provider in Laser Microprocessing comes in and provides these innovative services with pre- and post-processing of glass wafers joined with the newest technology in fs-Laser machines.

RESULTS

The evolving of the new USP-Laser technology and machines have led to new Laser Microprocessing Processes which we first all had to learn and will also ask for new handling tools, since the standard wafer handling tools have to be adapted to the glass wafers. Glass is a fantastic material and is available in numerous specifications of sizes, thicknesses, mechanical, electrical, optical and chemical specifications. This is challenging since a 10 µm wafer is so flexible that it needs obviously a different handling then a 3mm (= 3'000 µm) plate. Additionally, the standard foiling and framing of wafers and devices (dies, chips, etc.) as it is known from semicon processes lend itself to improve efficiency, but have to be modified to the needs of USP-Lasers and glass.

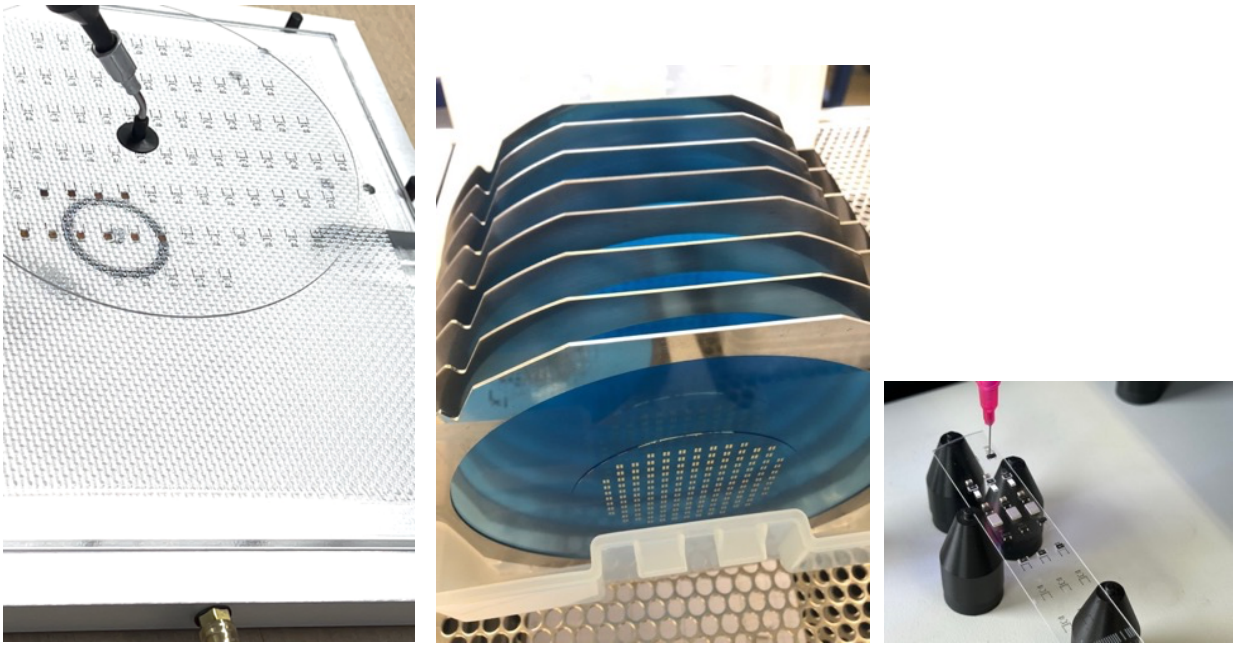

Fig. 3: Tools for glass wafer handling at Yalosys AG before and after it is being placed to the fs-Laser dicing process

DISCUSSION & CONCLUSIONS

Over the past few years, the USP-Laser technology has opened new routes for Microprocessing Microsystems on and IN GLASS and this on wafer scale and hence lends itself for highly efficient production from low to very high-volume device production.

However, the USP-Laser Microprocessing is not the solution alone. The right and efficient "macro" handling with the tools known from semicon processes have to be modified and adapted to glass and glass wafers.

Smart solutions of this so called IN GLASS Technology will have the potential to move the production of 2.5D or 3D packaging of devices like hermetically tight and bio compatible implants, photonics integrated circuits (PIC), integration of micro-optics in MEMS, Sensors, VCSL, Lidar, etc. to a new level of feasibility, miniaturisation and efficiency in production.

REFERENCES

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