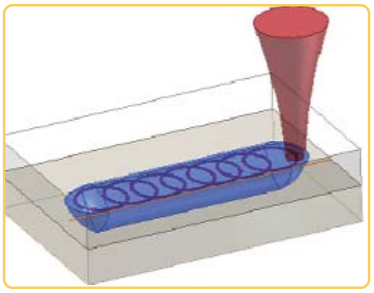
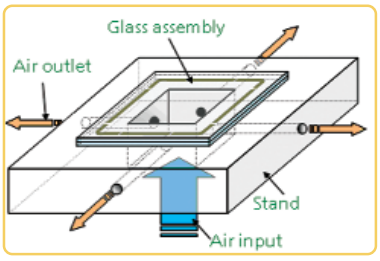
ASSEMIC ANNUAL REPORT 2007- Science (II)



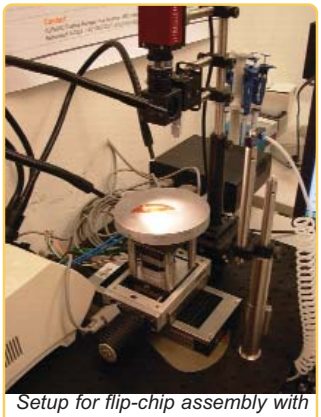


Two new methods for laser bonding developed, implemented and tested at ILT (left, TWIST, right, glass soldering for package applications)

Workpackage III. Microassembly is devoted to advanced tools and systems for microassembly applications, involving also joining and bonding issues.

WUT's reported a comparative study on advantages of integrated monolithic versus hybrid Microsystems, delivered by **ER Marius Pustan** and **Prof Rymuza**. The conclusion seems clear: if monolithic alternative technologies are available, the solution tends to be considerably more cost efficient, unless in some cases with very small manufacturing volume. Some ASSEMIC partners have demonstrated interesting and promising approaches: the photodiode fabrication-integration with polymeric waveguide (SU-8, PMMA) researched by **ER Irina Bineva** at **IMT**. or the alternative packaging solution described below.

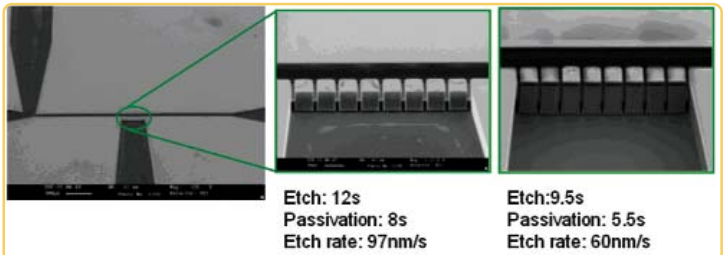
The work reported by Fraunhofer ILT focused on two different technologies, ER Cedric Chaminade developed laser-based glass soldering from MEMS Packaging, whereas two glass plates are soldered using diode laser, providing an innovative packaging/integration solution. On the other hand, **ESR Andrei Boglea** developed the novel processing approach TWIST for joining of polymers with seam width < 100 µm. This innovative concept, standing for Transmission Welding Incremental Scanning Technology, is based on the implementation of highly dynamic circular movement combined with linear feed of the fiber laser beam.The process optimization and experimental results have demonstrated its reliability as a promising novel technology, whose potential is to be further explored after the end of ASSEMIC.



Setup for flip-chip assembly with beamsplitter developed by Zybszek Rozynek and Domnita Fratila

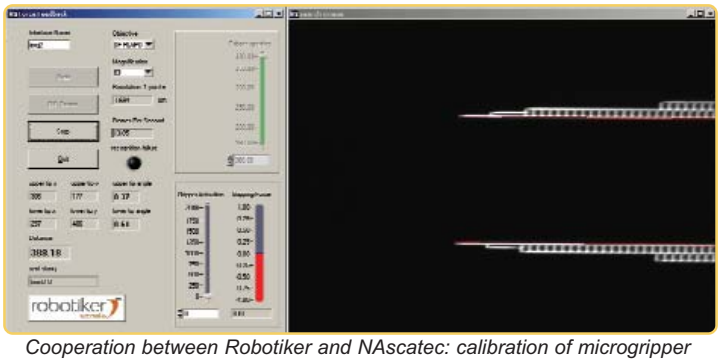
ESRs Gergely Perlaky and **Samuel Serra (RAL)** presented successful results on deep silicon etching using an STS deep etcher as alternative technology for the development of Microsystems. In order to solve the reproducibility and reliability problems which appeared in a previously reported work when developing SU-8 microfluidic chips by UV lithography and adhesive bonding, a new approach was implemented, consisting of fabrication of silicon on glass microfluidic devices by deep reactive ion etching (DRIE) and anodic bonding.

ESR Zbyszek Rozynek at **Profactor (formerly ARC)** enhanced the setup for mounting of silicon force sensor with dedicated vision alignment system, by integrating (hardware and software) a heating plate for bonding and rotation stage in the substrate positioning system.

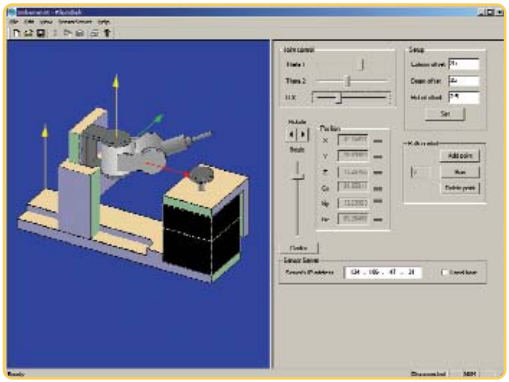


Results of experiments for optimization of RIE process done at RAL

Wok package IV. Automation of industrial micro-assembly was focuses on two different aspects: automated handling and assembly with intelligent control techniques is being explored. WP leader **Robotiker** cooperated with **Nascatec** for machine vision procedures applied to imatge calibration, object identification and handling **ER Cedric Ada** implemented an application of micropositioning using reinforcement learning. **Cedric Ada** reported simulation tests using various algorithms and various action sets, with tests on Robotiker microrobotic platform to be performed.



Cooperation between Robotiker and NAscatec: calibration of microgripper



Screenshot of Oldenburgs software

Oldenburg's ER Marek Idzikowski reported work on visualization of the manipulator and the workspace with efficient 3D rendering, simulation of the Kleindiek manipulator and testing.

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