

Editorial

Welcome to the second edition of the ASSEMIC newsletter. Within the 1st year of ASSEMIC a lot of fellows have been contracted at the different partner institutions and they started their training activities. The fellows made a lot of progress in their scientific work and reached - supervised by the Scientists in Charge - several research highlights.

This newsletter will give you information about ASSEMIC, Marie Curie Research Training Network related to handling and assembly in microtechnology.

Once a year, ASSEMIC will inform the industry and the interested public about the progress of the research, the consortium and all issues related to the implementation of this 4 year project.

To make sure you receive all issues of the ASSEMIC newsletter register by sending an email to the co-ordinator:

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Events 2004

The ASSEMIC **Kick-Off Meeting** took place from January 29th – 31st, 2004 in Vienna. All network partners were present defining the next steps for the start of the project. As the 2nd day of the Kick-Off Meeting was public several interested persons from universities as well as from companies attended the event.

The first **open academic seminar** was held in Vienna on November 4th – 5th, 2004. The aim of the seminar "Handling and Assembly in Microtechnology" was to give an

overall introduction to the thematic as well as an introduction to the network and the objectives of the Marie Curie programme. All fellows were present and had the opportunity to become acquainted with each other. The fellows also had the possibility to introduce themselves and to speak about their training at the hosting institutions.



Fig. 1: Pick and place in a SEM during the 1st open academic seminar

On December 6th – 8th, 2004 the 1st ASSEMIC **Summer School** took place in Neuchatel, Switzerland. This annual event was focused on the topic of "Handling and Assembly of MOEMS".



Fig. 2: 1st Summer School Neuchatel

Public Relations

An information folder for ASSEMIC has been designed and is available now. It can be ordered from the project co-ordinator.



Fig. 3: ASSEMIC-Information-Folder

ASSEMIC was present at the annual **IAESTE job fair** at the Vienna University of Technology on May 12th, 2004.



Fig. 4: IAEST Job fair

On September 12th – 15th, 2004, the **XV Eurosensors Conference** took place in Rome. ASSEMIC generated a lot of interest by means of a successful poster presentation. Several applications of potential fellows as well as new associated partners are the result of this PR-Activity.



Fig. 5: Poster Presentation at XV Eurosensors Conference

ASSEMIC was presented at the **YO-Einstein** (June 6th – 7th, 2004) which is an Austrian event for raising public

awareness in science and technology.

Fellows

Currently 13 fellows are trained in the network. 12 of them are "Early Stage Researchers" and one of them is an "Experienced Researcher".

For the year 2005 there are 6 free training positions within ASSEMIC. If you are interested in getting trained in the frame of ASSEMIC send your application. Further details about the free positions can be found on the ASSEMIC Homepage: www.assemic.net

Science

Micropositioning:

The first issue in the field of positioning stages and elements was the definition of requirements for the micropositioning system, closely linked to the targeted final application. Thus, several potential target micromanipulation applications (handling of TEM slices, biomedical and biotechnological applications, and assembly of optoelectronic components) have been discussed with the aim of defining the concrete requirements and the components needed for the positioning system.

Uni-OI has built a new nanomanipulation setup into the vacuum chamber of a Scanning Electron Microscope (SEM). Their ESR has been involved in the modification/design of a mobile platform making the manipulation of a probe on the probe holder easier.

FORTH worked on material issues, concerning themselves with micropositioning as well as surface roughness measurements on microcomponents and the analysis of their friction properties. FORTH has

analysed main failure modes and mechanisms as far as mechanical (stress-induced failure, point defects, dislocations, precipitates and fatigue), tribological (stiction and wear), and other issues (delamination, stray stresses, parasitic capacitance and environmentally induced failure mechanisms, such as vibration, shock, humidity and radiation effects, particulates, temperature changes and electrostatic discharge) are concerned.

Uninova has presented their Linear Array of Thin Film Position Sensitive Detectors (LATFPSD array) enabling the integration of position and distance sensors and feedback control into the positioning stages. Uninova's ESR is working on the testing and characterization of this device. An important issue to be dealt with in the next months is the establishment of a list of requirements and conditions in order to be able to integrate this position sensor into the micropositioning platform.

Microhandling:

Efforts have been made to develop different types of prototype microgrippers. Nascatec has reported the successful design, the fabrication of the necessary masks and the production (using silicon dry etching) of an electrostatic microgripper. Their ESR is focusing on the mechanical simulation by means of Finite Element Analysis (FEM)

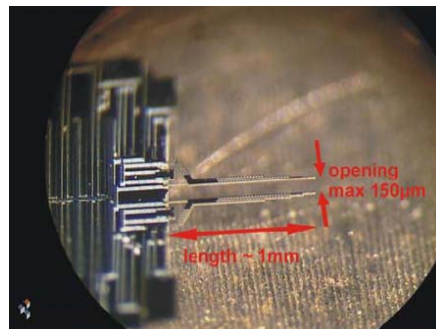


Fig 2. Electrostatic gripper (Nascatec)

A new type of microgripper was developed by TU Vienna. It is based on a magnetic actuation principle (see fig. 6).

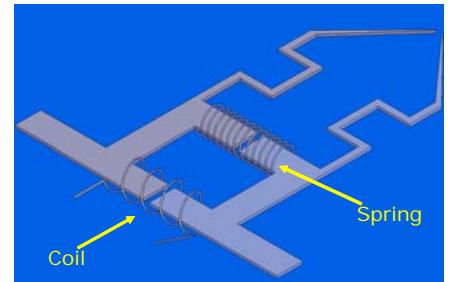


Fig. 6: CAD-Model of the Microgripper

The gripper has been produced by LiGA using SU-8 and was galvanised with Ni. The width of the tip is approximately 100µm. Two pictures of this microgripper can be seen below.

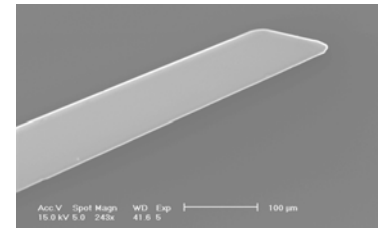


Fig. 5. REM pictures of an electromagnetic microgripper (TU Vienna)

SSSA presented a technology available for PST-actuated tools by using Shape Deposition Manufacturing (SDM) developed in cooperation with the University of Uppsala in Sweden. The common fabrication technique consists in placing a piezoelectric actuator inside a soft silicon mould, casting the liquid polymeric components in the room, left after the piezoelectric insertion, and extraction of the complete microgripper device, after the polymerising of fingertips. A first microgripper series was fabricated and characterized, including measurement of adhesion forces.



Fig 3. Tools for SMD processes (SSSA)

Seibersdorf Research recently started experiments testing a microfabrication technology for the production of microgrippers based on a combination of LiGA and Powder Injection Moulding (PIM). In difference to classical LiGA with injection moulding that is used for producing polymer components, is that this approach enables low cost mass replication of microcomponents in a wide range of novel materials (including ceramic and metals). Thus providing an opportunity for the production of low cost microgrippers with electromagnetic, electrostatic or piezo actuation.

A study on gripping problems in the microdimension has been done. It is concerned with positioning strategies, process feedback, system integration, microrobotics, adhesion and tribological issues within the microdimension.

Finally, some novel strategies for microgripper designs have been proposed.

Further work will be performed on a special intelligent coating for microgripper tips that will help to overcome the problem of adhesive forces.

Uni-OI adapted and tested tools for manipulation of nanowires, and has done several experiments concerned with gripping nanowires and bonding them with the help of Electron Beam Deposition (EBD). Satisfactory results (nanowires were gripped from a substrate surface and deposited on a TEM-grid) were reached in this area.

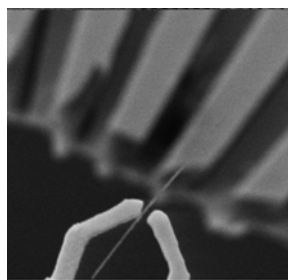


Fig. 7. Nanowire manipulation (UniOI);

Progenika and CCLRC/RAL initiated the analysis of requirements and the definition of concept/design for the deposition of functional layers on biomedical cantilevers. The development of new fabrication technologies for such cantilevers will be the main research topic for the next year.

Microassembly:

A joining tool integrated in a microgripper has been developed by FhG/ILT, which will serve as a basis for further work in the ASSEMIC project. This new interconnection technology combines the two individual processes of mounting and assembly to one single process step.

TU Vienna performed a study on the state-of-the-art of micro-gluing techniques.

Further work related to the assembly, testing and improvement of a 4x4 and 8x8 cross connector switch for optical fibres was done in cooperation between FSRM and the University of Neuchâtel. Steps involved in the assembly include cutting, aligning, gluing and testing the different components such as GRIN lenses, mirror chips and fibre ribbon, as well as sealing, wire bonding and integration on the PCB.

A study has been done on efficient microassembly (Seibersdorf Research, WUT). The study includes several concepts, differences between Parallel and Serial assembly and other elements and topics involved in microassembly. A special chapter is devoted to the issue of the combining of tools for handling and assembly.

Events 2005

Annual Network Meeting

The ASSEMIC Annual Network Meeting 2005 will take place from March 14th – 15st, 2005 in Vienna.

On March 15th, 2005 there will be a public information day in the frame of the annual meeting, designated to the industry.

2nd Open Academic Seminar

The second open academic seminar will be held in Oldenburg (Germany) on October 24th – 25th, 2005. The topic is related to microrobotics. The seminar is open to all interested persons.

2nd Summer School

On November 16th – 18th, 2005 the second ASSEMIC Summer School will take place in Neuchatel, Switzerland. This annual event is focused on the topic of "Biomedical Applications".

Partnership – Collaboration

You would like to know more about ASSEMIC or become an associated partner, please visit:

www.assemic.net



This newsletter is free and has been edited by Vienna University of Technology, Institute of Sensor and Actuator Systems under the ASSEMIC project.

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