

Germany / Allemagne

(645)

**UNITWIN/ UNESCO Chairs Programme**

**Progress report**

**Period of activity: January-December 2006**

**UNESCO Chair in Macromolecular Characterization**

**Report established by :** Prof. Dr. Harald Pasch, UNESCO Chairholder, Head of the Analytical Department of German Institute for Polymers

**I. Activities**

**1. Academic activities**

*Education*

-MS and PhD studies in Chemistry.

- Series of lectures
- Theme: *Polymer characterization*  
Duration: throughout the academic year  
Target groups: 15-20 male and female graduate students  
Geographical coverage: International (students from Eastern and Western Europe, Asia, Africa)
- Theme : *Polymer characterization*  
Duration: two times per year, one week each  
Target groups: 15-20 male and female undergraduate and graduate students at University of Stellenbosch, South Africa  
Geographical coverage: students from Africa, mainly South Africa

*Training*

- Projects to obtain MS in chemistry with major in macromolecular chemistry,  
Duration: 6 months per MS project  
Target groups: male and female undergraduate students  
Males: n/a  
Females: 1 from Russia, 1 from Cameroon  
Geographical coverage: international
- Projects to obtain PhD in chemistry with major in macromolecular chemistry,  
Duration: three years per PhD project  
Target groups: male and female graduate students

Males: 1 from India, 1 from Gabon, 1 from Pakistan, 1 from France, 1 from Spain,  
3 from Germany  
Females: 2 from South Africa, 1 from Germany  
Geographical coverage: international

### *Research*

- Projects on *chromatography and spectroscopy of polymers*  
Duration: throughout the academic year  
Target groups: male and female graduate and undergraduate students  
Geographical coverage: international

## **2. Conferences/ Congresses/ Meetings**

- Conference
  - Theme: *9<sup>th</sup> UNESCO School and IUPAC Conference on Macromolecules*  
Place: Stellenbosch, South Africa  
Date: November 20-23, 2006  
Two presentations of PhD students were given
- Workshops-meetings
  - Theme: *Latest Analytical Techniques for the Analysis of Complex Polyolefin*  
SASOL,  
Place: Johannesburg, South Africa  
Date: November 15, 2006  
The workshop was given by Prof. Pasch for junior and technical staff of SASOL

## **3. Partnerships/ Inter-university Exchanges**

- UNESCO Center of Macromolecules, University of Stellenbosch (South Africa) : 2 PhD students were received for a total duration of 6 months.

## **4. Publication**

The Chair-holder, students and members of the Chair have maintained an active programme of publications in the field of Macromolecular Characterization.

- N. Luruli, L.-C. Heinz, V. Grumel, R. Brüll, H. Pasch, H.G. Raubenheimer:  
*Copolymerization behavior of Cp<sub>2</sub>ZrCl<sub>2</sub>/MAO and [(CO)<sub>5</sub>W=C(Me)OZrCp<sub>2</sub>Cl]/MAO: A comparative study on ethylene/1-pentene copolymers.*  
*Polymer 47 (2006) 56*

- Y. Liu, W. Radke, H. Pasch: *Onset of the Chromatographic Mode Transition from Hydrodynamic Chromatography to Slalom Chromatography: An Effect of Polymer Stretching.*  
*Macromolecules* 39 (2006) 2004
- A. Brüll, H. Pasch, M. Bashir: *Development of Fast Gradient Separations for Different Polymethacrylates.*  
*e-polymers* (2006) No. 047

## II. Outcomes

The UNESCO Chair for Macromolecular Characterization has been established jointly at DKI and TUD. The official inauguration took place on 21 June 2005. The Chair is linked to the characterization groups of the different departments of DKI and TUD, including the Analytical, Physics and Chemistry Departments. The Chair is open to universities and other research institutions of the European region and of the developing world. Special emphasis is on cooperation with research institutions of Southern Africa, in particular the UNESCO Center for Macromolecules at the University of Stellenbosch, which is the largest polymer resource centre for training of students from South Africa and other developing countries, in particular black students.

The objective of the Chair is to develop expertise and conduct education and training in macromolecular characterization. To this end, curricula for undergraduate, MS and PhD courses for students from developing countries are planned, structured and executed.

In a later stage a network for polymer characterization between different universities and other academic institutions shall be implemented. This network aims at establishing education and training facilities and using a broad range of methods for polymer characterization which are required to upgrade research in polymer synthesis and technology.

In the initial phase of the Chair, financial and material resources have been allocated to conduct education and training for undergraduate and graduate students. At present, series of lectures on polymer characterization are given in Darmstadt and Stellenbosch. MS and PhD courses and projects are offered to students from developing countries that are sponsored by German governmental organizations and major chemical companies. Based on an exchange program MS and PhD students from South Africa are sponsored to conduct part of their experimental work at the Chair.

In 2006, 6 students from developing countries used the Chair for their MS and PhD studies.

All teaching facilities are available and up to date. More laboratory space must be allocated to run all the research projects that are planned. Already in the first phase of the Chair activities a significant number of students, mainly from Africa, visited the Chair and conducted some experimental work for their MS and PhD theses.

### III. Forthcoming activities

In a later stage a network for polymer characterization between different universities and other academic institutions shall be implemented. This network aims at establishing education and training facilities and using a broad range of methods for polymer characterization which are required to upgrade research in polymer synthesis and technology. In parallel to upgrading the knowledge and experience of the scientific and technical personnel by teaching and training, the analytical hardware must be upgraded.

The methodology to be followed is as follows:

- In a first step, information is collected on what training and education facilities as well as analytical equipment is available at different participating institutions and how it is used. To acquire this information, contact persons shall be found.
- By visiting the participating institutions, the type, quality and capabilities of the curricula and training facilities as well as available equipment and personnel shall be evaluated and a general overview on the research activities in polymer science and technology shall be established.
- In parallel to Point 2, curricula for undergraduate, MS and PhD courses are established at DKI /TUD that are specifically designed for students from developing countries.
- To upgrade the knowledge of the scientific and technical staff at different institutions and to initiate new activities in polymer characterization, courses on polymer analysis and characterization. In the initial stage 1-2 week introductory courses are proposed.
- For a proper flow of information, regular seminars on polymer analysis and characterization shall be organized. These seminars are conducted at the newly formed UNESCO Chair or could be a part of the annual UNESCO School & Conference on Macromolecules organized by the University of Stellenbosch, South Africa.

In a later stage, workshops with hand on training shall be organized for different analytical techniques. These workshops are to be organized by different institutions to improve the cooperation within the network.