



*AKTION ÖSTERREICH - TSCHECHISCHE REPUBLIK*

*AKTION ČESKÁ REPUBLIKA - RAKOUSKO*

## **Final Report – Závěrečná zpráva – Abschlussbericht**

### **Deepening of knowledge about hydrogels with the controlled internal structure – Czech-Austrian bilateral cooperation**

Participants of the project:

Scientists: Ass.-Prof. Ing. Milan Kracalik, Ph.D, (JKU Linz)  
Ing. Jiri Smilek, Ph.D. (BUT Brno)

Students: Ing. Richard Heger (BUT Brno)  
Ing. Monika Trudicova (BUT Brno)  
Ing. Elke Bradt (JKU Linz)

The project AKTION No. 94p1 Deepening of knowledge about hydrogels with controlled internal structure – Czech-Austrian bilateral cooperation was realized in a period from 15. 10. 2022 to 15. 12. 2022 at the Brno University of Technology in Czech Republic and at Johannes Kepler University Linz in Austria. The main goal of this project was the complex study and deepening and sharing of knowledge about chemistry of hydrogels with tailored internal structure focused mainly on the preparation, characterization and final application of these unique materials.

This project continues with bilateral cooperation between both involved universities. Thanks to the AKTION project, we developed promising cooperation between both institutions, which can lead to more scientific projects as well as manuscripts in impacted journals.

Two lectures were given within the project framework. The first one was given by J. Smilek at the Johannes Kepler University in Linz named “**Suitable characterization techniques in recent research of hydrogels**”. The second one by M. Kracalik at the Brno University of Technology named “**Novel trends in rheology of semi-solid materials**”. Both presentations were given within the scientific group meetings (in Brno as well as in Linz). Ph.D. students and MSc. students attended lectures and the following discussion.

Table 1: Involved persons in AKTION project from FCH BUT

<b>Person</b>	<b>Home university</b>	<b>position</b>	<b>Visit (2022)</b>
Jiri Smilek	BUT Brno	Scientist	5 days
Richard Heger	BUT Brno	Ph.D. student	14 days
Monika Trudicova	BUT Brno	Ph.D. student	14 days

Table 2: Involved persons in AKTION project from JKU Linz

<b>Person</b>	<b>Home university</b>	<b>position</b>	<b>Visit (2022)</b>
Milana Kracalik	JKU Linz	Scientist	5 days
Elke Bradt	JKU Linz	Scientist	0 days*

\*Unfortunately, Ing. Elke Bradt from Johannes Kepler University cannot visit Brno University of Technology due to some medical issues. Funds allocated in project proposal for her stay in Brno were returned to AKTION (see Budget justification).

## **Reports from each individual stay**

### **Richard Heger**

During the AKTION project 94p1, Ph.D. student Richard Heger visited and stayed at the JKU in Linz from 14th November 2022 to 27th November 2022. He was responsible for the agarose hydrogel preparation, which took place at the FCH BUT in the Czech Republic and as well at the JKU in Linz in Austria. Samples prepared at BUT were transported to the JKU, rheologically characterized at JKU, and compared to the samples prepared at JKU. At the JKU he acquainted himself with their approach to rheological measurements as well as with the possibilities of rheo-raman measurements and possible information and settings needed to carry the instrumentation over to the BUT.

Together with Monika Trudicova, he obtained information about the possibility of using a microtome, which is at JKU, to obtain thin hydrogel cuts needed for a number of analytical and characterization techniques. Since there are relatively few suitable devices and people with sufficient knowledge in the Czech Republic, about using microtome to cut hydrogels, the visit and following discussion may lead to an extension of cooperation in this direction.

Lastly, during his stay at JKU, microrheology, more precisely, DLS measurement of viscous materials, was discussed, since BUT team has an extensive experience in this direction.

### **Monika Trudicova**

The internship at Johannes Kepler University in Linz (as part of the AKTION project 94p1) was realized from 14th November 2022 to 27th November 2022. During this internship, she became familiar with their approach to rheological measurements and also with the possibility of characterizing hydrogels using RHEO-RAMAN equipment. Assoc. Prof. Kracalik showed her the laboratories of his team at JKU in Linz as well as their available instrumental possibilities. She was also introduced to the synthesis of biopolymeric hydrogels, especially hydrogels based on poly(2-hydroxyethyl methacrylate) (pHEMA).

She is also interested in the proper characterization of the structure of hydrogels at BUT, however, for trying new methods, it is necessary to obtain a thin layer of hydrogel. Since JKU has a lot of experience using a microtome, together with Richard Heger, they obtained information about the possibility of using it for cutting hydrogels. The subsequent discussion may lead to the expansion of cooperation in this direction. Subsequently, they consulted with Elke Brand DLS microrheology measurements on instruments of the Zetasizer Nano series, since the BUT team has an extensive experience in this area.

She was also responsible for the preparation of hydrogels at BUT (hydrogels based on poly(vinyl alcohol)) and the rheological characterization of these hydrogels at BUT. Hydrogels based on poly(vinyl alcohol) (PVA) were also prepared and rheologically characterized at the JKU in Linz.

### **Jiri Smilek**

Jiri Smilek as the main investigator of AKTION project has been responsible for the project administration and project funds. During short stay at Johannes Kepler University in Linz, Austria (5 days), he gave a presentation aimed on the characterization techniques which are suitable for bulk as well as internal structure of hydrogels. The joint project possibilities with prof. Milan Kracalik as well as with the head of scientific group (prof. Sabine Hild) has been discussed during his stay.