REPORT

on the solution of the AKTION project No. 92p18 – Corrosion processes in sintered materials based on Fe

Basic data: start of the project solution 1.1. 2022
end of the project 31.12.2022

Project partners: TU Wien – a.o. Univ. Prof. Dr. Günter Fafilek, Technische Universität Wien, Institut für Chemische Technologien und Analytik
BUT in Brno – Doc. Ing. Marie Sedlaříková, CSc., Technical University In Brno, Institute of Electrotechnology

Progress of the project solution:

Working stays of academic staff of BUT in Brno at TU Wien

Stay on: 25.1. 2022-26.1. 2022

Participants of the working stay: Doc. Ing. Marie Sedlaříková, CSc, Ing Miroslav Zatloukal

Meeting partner: Prof. Günter Fafilek

Samples were evaluated, which were prepared at BUT in Brno and thermally processed at TU Wien facilities. Procedures for the evaluation of properties were agreed upon, and procedures for the preparation of the next generation of sintered materials were preliminarily agreed upon. Methods of publishing the results of research papers were discussed, and study stays of students at both cooperating universities were agreed upon. In the laboratories, the possibilities of a wider involvement of the unique instrumentation at the TU Wien were assessed, with the understanding that additional samples will be prepared and subsequently tested using other appropriate methods. The aim is to obtain the most perfect picture of corrosion phenomena in iron-based sintered materials with other additives.

Stay on: 28.11. -29.11. 2022

Participants of the trip: Doc. Ing. Marie Sedlaříková, CSc., Ing. Miroslav Zatloukal

Date: 28.11. -29.11. 2022

Meeting partners: Prof. G. Fafilek, E. Vigl, L. Varain

Test results of sintered materials have been reviewed, with some of the most significant results being included in a joint publication. Part of the working meeting was the specification of further cooperation in the field of corrosion properties of special sintered materials using the top equipment of both partners. New technological procedures for the preparation of materials of a new composition will be used, test procedures will be modified with the aim of confirming theoretical assumptions in the behavior of sintered materials in specific environments, such as physiological fluids.

Furthermore, the content of the subsequent working stay of TU Wien students at BUT workplaces in Brno was specified

Working stays of BUT students in Brno at TU Wien

Date: 25.1. 2022-3.2. 2022

Participant of the stay: B.Sc. Matúš Soboňa

Content of the stay: Based on the agreement, prepared mixtures of powdered metals were thermally processed at TU Wien in inert atmospheres. Furthermore, basic test operations were carried out with the aim of verifying the proposed firing procedures. Basic electrochemical measurements were carried out, the effect of heat treatment on the composition of sintrates was assessed, including the distribution of individual metals in the

total volume of samples. The results will be further used to adjust the composition of the starting raw materials for the next stages of the research.

Date: 28.11. – 7/12/2022
Participant of the stay: Ing. Jan Kuchařík
Content of the stay: Preparation of new iron-based bone implant systems with additives to verify their solubility in physiological solutions. During the stay, starting materials were made based on a mixture of metal powders with different amounts of polymer binders. The resulting sintrates were verified both visually and on the basis of electrochemical tests. The samples were subsequently tested in physiological solutions and compared with materials processed at BUT in Brno. Based on the results, modifications of the bone replacements were proposed in the following year with the aim of influencing the corrosion processes of the implants.

Work stays of TU Wien academic staff at BUT in Brno:
Date: 22 - 23 8. 2022
Participants of the stay: Prof. Fafilek G., Mairhofer K., Varain L.
During the working stay, the previous results of scientific cooperation in the field of corrosion processes of sintered materials were summarized, tests in real environments using electrochemical and optical methods were evaluated. Procedures for the production of additional test samples were agreed upon, with the provision that the precursors will be prepared at the BUT in Brno, heat treatment in an inert atmosphere will be carried out at the TU Wien facilities. Furthermore, the dates and contents of the stay of TU Wien students at BUT in Brno were specified. Part of the stay was participation in the ABAF 2022 international professional conference.

Work stays of TU Wien students at BUT in Brno
Date: 28.11.-7.12. 2022
Participants of the stay: Vigl E., Varain L.
During the working stay, tests of prepared materials were carried out at TU Wien using the facilities and equipment of BUT in Brno, such as Bio-Logic potentiostatic stations, VEGA electron microscope with analyzer, confocal microscope, box with inert argon atmosphere, etc. The obtained results will be used in further stages of joint research,.

Publishing activity:

M Sedlaříková *et al* : Corrosion processes of sintered materials based on Fe, 2022 *J. Phys.: Conf. Ser.* **2382** 012019
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Corrosion processes of sintered materials based on Fe

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Evaluation of cooperation within the AKTION 92p18 project:

1. The cooperation between the two universities was very successful and fulfilled the requirements given by the project assignment
2. The results of joint research were summarized in a joint publication
3. The benefit was mainly the working stays of students at partner universities.
4. The results of joint research in the field of materials, their preparation and the verification of their properties provide a good basis for the extension of long-term cooperation.

BRNO, 20.1. 2023