

PROJECT PARTNER SEARCH FORM

I offer my expertise to participate as a Partner in a Horizon Europe Project

I am planning to coordinate a project and I am looking for Project Partners

TOPICS OF INTEREST

HORIZON-CL4-2021-RESILIENCE-01-17: Advanced materials for hydrogen storage (RIA)

PARTNER INFORMATION

Institute of Materials and Machine Mechanics of Slovak Academy of Sciences (IMSAS) would like to join the consortium as a Project partner / Work Package Leader / Task Leader to contribute to the call as mentioned above.

Metallic materials offers excellent load-bearing capacity, ductility, and damage tolerance represent the manufacturing backbone of engineering solutions and innovations for production, storage, distribution, and end-use applications of hydrogen. Although practically all metallic materials suffer from hydrogen embrittlement, recent studies on an equiatomic HEA and medium entropy alloy (MEAs) with single-phase FCC (face centred cubic) structure have shown that these alloys are less prone or even profit from hydrogenation. The research team of IMSAS has been working on the design, development and characterisation of novel **high strength high entropy alloys (HEAs) and precipitation strengthened complex concentrated alloys (CCAs)**, which can be applied for **hydrogen pressure vessels**. The **processing techniques** applied by the research team include **vacuum induction melting**, tilt and centrifugal **casting**, hot **forging**, **rolling** and **heat treatments** of HEAs and CCAs as well as **hydrogenation techniques**, **room temperature hydrogen charging and high-temperature hydrogen charging**.

IMSAS provides a **complete microstructural and chemical analysis** via high-end equipment, including XRD, FE-SEM equipped by EDS, WDS, EBSD, and HR-STEM (EELS, STEM mode, EDS) as well as thermo-mechanical properties measurement (TGA, DTA). Local **distribution of hydrogen** could be evaluated by silver reduction and decoration technique, hydrogen microprint technique and secondary ion mass spectroscopy (SIMS). **Mechanical properties characterization** could be investigated by the instrumented nanohardness, microhardness, instrumented hardness tests, tensile tests, quasi-static three-point bending fracture toughness tests, dynamic fracture toughness as well as thermomechanical testing. The analytical methods and finite element method (FEM) are used for **modelling** of tensile, quasi-static three-point bending and impact fracture toughness behaviour of investigated HEAs and reference CCAs.

Description of the Legal Entity

Institute of Materials and Machine Mechanics of Slovak Academy of Sciences (IMSAS) is a research institute founded by the Slovak Academy of Sciences in 1953. Traditionally, the IMSAS is focused on the research and development of new advanced materials based on non-ferrous metals and solving a wide range of related issues - from the development of unique technology of new materials, through exploring and characterising their internal structure, to the analytical and numerical modelling a simulation of the properties.

IMMS has successfully implemented over 20 EU funded projects (FP5 – H2020, COST, Interreg) and over 80 national research projects. IMMS also provides excellent research owning 20 patents, over 45 publications published worldwide in 2020, over 752 highly impacted CC publications and more than 5400 citations since its establishment. IMSAS team consists of 36 researchers, 12 researcher assistants, 12 members of

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administration support and 15 technicians and other employees. We constantly seek new collaboration opportunities, especially in Horizon Europe, to strengthen the position of the IMSAS in the international level. IMSAS cooperates closely with companies in Slovakia, Germany, France, and Austria in the field of material development, microstructural observation, and mechanical testing. Some of the cooperation leads to the successful research projects. Besides highly qualified staff, IMSAS provides various technological devices and testing methods.

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| <input type="checkbox"/> Higher Education | <input checked="" type="checkbox"/> Research Institution | <input type="checkbox"/> Public Administration |
| <input type="checkbox"/> Industry /SME | <input type="checkbox"/> NGO | <input type="checkbox"/> Other: <i>Please specify</i> |

Expertise of the Team Leader

Ing. Juraj Lapin, DrSc. is the head of the "Division of properties of materials and structures" at IMSAS. Five years he served as the Vice President of the SAS and three years as a member of Presidium of SAS responsible for the transfer of knowledge. He supervised 7 PhD students, 6 of whom remained to work in the research. He was a project leader of 24 projects. At the level of SAS, he is a director of the "Centre for Applied Research of New Materials and Technology Transfer", which is the consortium of 7 institutions (IMMM SAS, IEE SAS, IAC SAS, UPo SAS, IP SAS, STU, Academy of Fine Arts) and "Research Center Allegro" which is the consortium of 5 institutions (IMMM SAS, IEE SAS, IAC SAS, IP SAS, STU). These research centres were built in the frame of EU Structural Funds. Professionally, he is an expert in the development and characterization of advanced intermetallic alloys for high temperature structural applications, solidification, crystal growth, the development of technology for preparation of new materials, the study of relationships between microstructure and mechanical properties, analytical modelling and mechanical properties. He has extensive experience in the management of not only domestic but also foreign research teams. So far he has published 89 articles in CC journals and 33 articles in journals not included in CC. His works have been cited 1048 times in WOS and 12 times in Scopus (not included in WOS) with Hirsch index $h = 23$.

Description of the (Research) Team

Ing. Kateryna Kamyshnykova, PhD. – finished her PhD studies in 2019. She is specialised in metallurgy and phase transformations. She is experienced in VIM, solidification, casting, and microstructure optimisation by heat treatments. In the frame of the project, she will be responsible for the development of VIM in ceramic crucibles, tilt casting into ceramic moulds and heat treatment experiments. So far, she has published 6 articles in CC journals and 4 other articles included in Scopus. Her works have been cited 32 times in Scopus.

Ing. Alena Klimová, PhD. – she is an expert in theoretical and experimental problems of solidification of alloys, alloy development, microsegregation and macrosegregation behaviour of alloying elements, and microstructure and chemical analyses of alloys. In the frame of the project, she will be responsible for alloy development, chemical and microstructure analyses, evaluation of defects in castings by the metallographic techniques, microsegregation behaviour of alloying elements, and quantitative metallographic analysis. So far, she has published 14 articles in CC journals and 8 other articles included in Scopus. Her works have been cited 77 times in Scopus.

RNDr. Tatiana Pelachová, PhD. – she is a specialist in microstructure degradation, high-temperature oxidation behaviour of alloys, image analysis and microstructure analysis by OM, SEM, BSEM, TEM and XRD. In the frame of the project, she will be responsible for the microstructure analyses using SEM, BSEM, TEM and HRTEM/HRSTEM. So far, she has published 24 articles in CC journals and 11 other articles included in Scopus. Her works have been cited 230 times in Scopus.

Ing. Michaela Štamborská, PhD. – she is an expert in mechanics of materials. She works on the development of mathematical and simulation models, numerical modelling of heat transfer processes and deformation behaviour of materials. She is a specialist in digital image correlation method. In the frame of the project, she will be responsible for mechanical property characterisation and numerical modelling of deformation behaviour,

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experimental verification of the proposed simulation models and numerical calculations. So far, she has published 16 articles in CC journals and 14 other articles included in Scopus. Her works have been cited 85 times in Scopus.

Potential role in the project

- Research Training
 Dissemination Other: workpackage leader, task leader

e.g. project leader, scientific coordinator, workpackage leader, product development expertise.

Already experience as a	Coordinator	<input type="checkbox"/> YES	<input type="checkbox"/> NO
	Partner	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
	Expert Evaluator	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
CONTACT DETAILS			

Contact Person: Juraj Lapin
Organization: Institute of Materials and Machine Mechanics of Slovak Academy of Sciences
City: Bratislava
Country: Slovakia
Phone: +421905851725
Email: juraj.lapin@savba.sk
Organization Website: http://www.umms.sav.sk/en/
Contact Person Webpage: - SAV - Juraj Lapin

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