



NATIONAL INSTITUTE OF CHEMISTRY



NATIONAL INSTITUTE OF CHEMISTRY

**BOOST YOUR CAREER WITH MSCA POSTDOCTORAL FELLOWSHIP
AT THE NATIONAL INSTITUTE OF CHEMISTRY, SLOVENIA**

**HORIZON EUROPE
MARIE SKŁODOWSKA CURIE ACTIONS
POSTDOCTORAL FELLOWSHIPS CALL
2023**

BASIC FACTS:

- 9 Departments
- 375 Employees
- 120 PhD students



Expanding knowledge of chemistry and associated studies
Transferring knowledge to younger generations
Applying newly acquired knowledge to industry

With excellent research...

Biotechnology

Life sciences research

Analytical chemistry

Nanotechnology

Food chemistry

Energy

Theoretical and structural chemistry

Chemical engineering

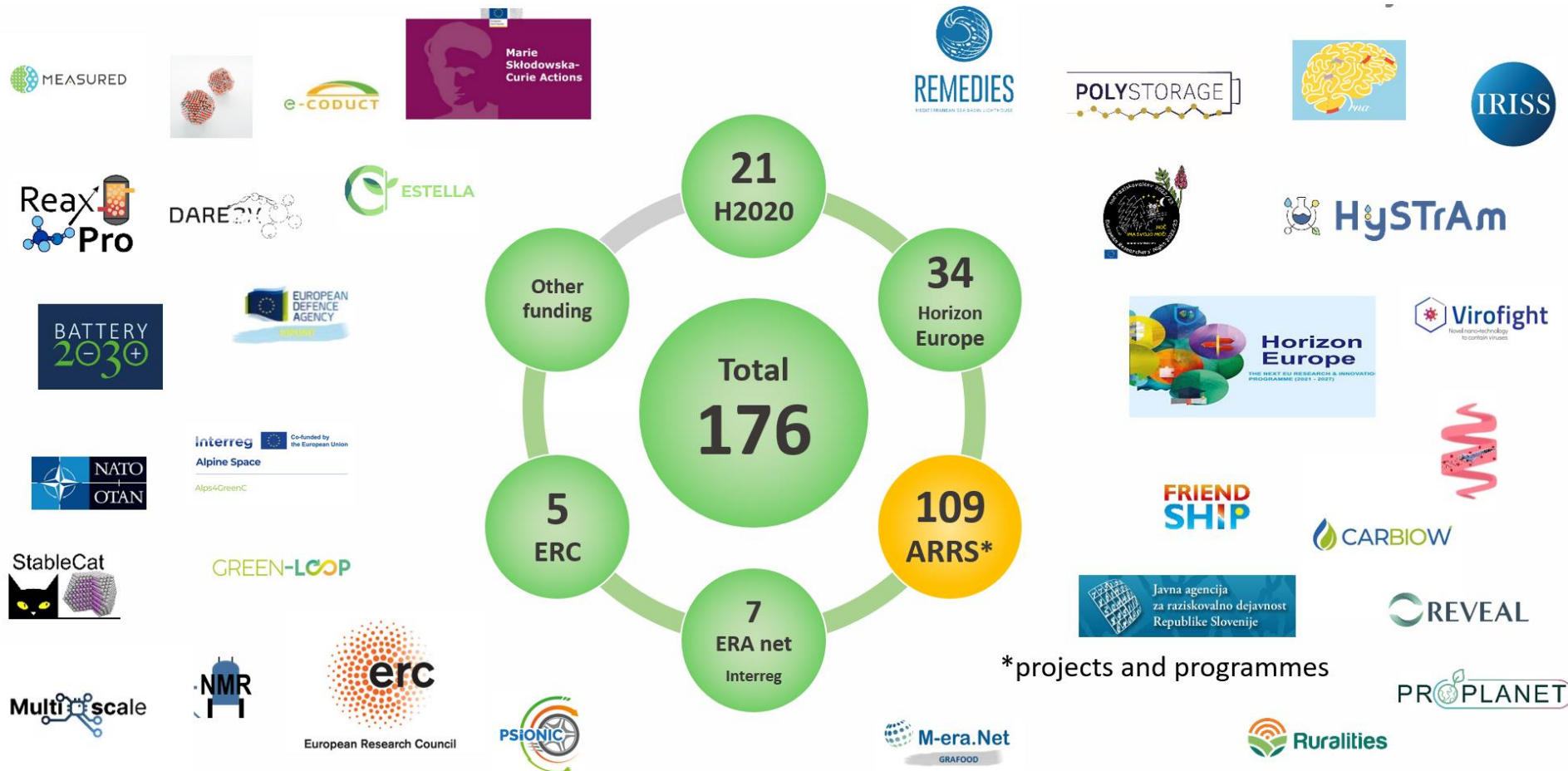
Materials research

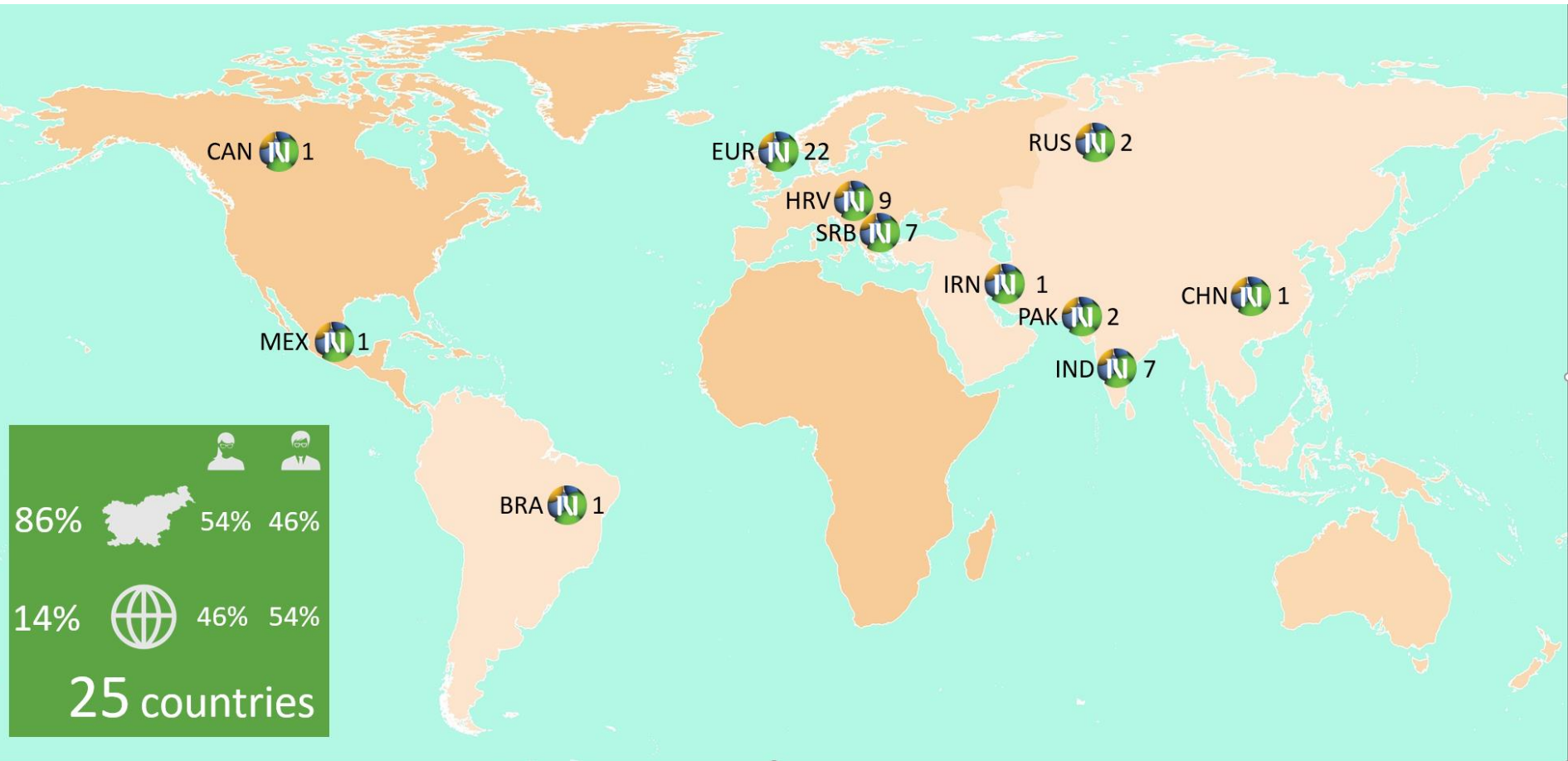


erc



...we create new knowledge and help solving societal challenges.







Expanding knowledge of chemistry and associated studies



Transferring knowledge to younger generations



Applying newly acquired knowledge to industry





Prof. dr. Roman JERALA
ERC Advanced Grant holder

TOPIC 1

Designed bionanostructures
(protein origami)

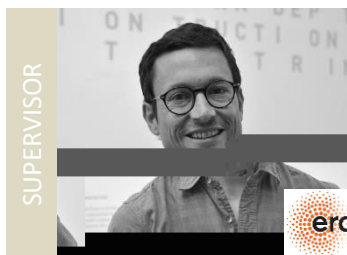
TOPIC 2

Cancer immunotherapy

TOPIC 3

Synthetic biology of
mammalian cells – design of
signaling pathways

[More information](#)



Prof. dr. Jernej ULE
ERC Advanced Grant holder

TOPIC 4

RNA networks

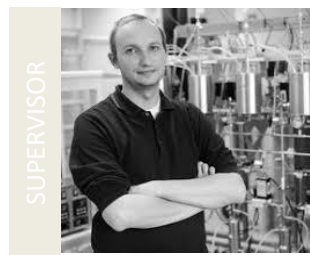
How do RNA-RNA and protein-RNA interactions guide the assembly of RNPs, and thereby coordinate RNA regulation and gene expression?

How do RNPs contribute to neuronal differentiation and function?

How do the RNA-protein networks evolve, and how do mutations in transposable elements and cryptic intronic splice sites contribute to this evolution?

How do mutations cause disease by disrupting the assembly and function of RNPs, and what treatments could ameliorate this?

[More information](#)



Prof. dr. Blaž LIKOZAR

TOPIC 5

Application of chemical reaction /reactor engineering/multi-scale process modelling to new emerging challenges

- **chemical (process) engineering, reactor and unit operation design and construction, as well as multi-scale process modelling.**
- **carbon dioxide conversion:** reverse water-gas shift (RWGS), methanol, formaldehyde, dimethyl ether (DME), carboxylation, *etc.*
- **natural gas conversion:** non-oxidative/oxidative methane conversion to ethane, ethylene and others, dehydrogenations, *etc.*
- **electro-catalysis with fuel cell technologies:** novel catalyst fabrication, characterisation and application (ORR, HER, CO₂RR, *etc.*).
- **biomass valorisation to bio-based compounds:** lignin, cellulose, hemicellulose, aromatics, hydroxyl-methyl furfural, furfural, *etc.*
- **(bio)pharmaceutical processes:** particle engineering development (e.g. crystallisation)

[More information](#)



Prof. dr. Miran GABERŠČEK

TOPIC 6

Synthesis and advanced electrochemical characterisation of low-cost and sustainable electrocatalysts for Fuel Cells/Electrolysers

[More information](#)



Assoc. Prof. dr. Nejc HODNIK
ERC Starting Grant Holder

TOPIC 7

Electrocatalysis

- Fuel Cells and Electrolyzers
- Electrocatalyst synthesis and development
- Advanced electrochemical techniques and electrocatalyst stability
- Electron microscopy
- Electrochemical noble-metal recycling
- Organic electrosynthesis

[More information](#)



Assoc. Prof. dr. Marjetka PODOBNIK

TOPIC 8

- **Structural and functional studies of proteins involved in pathogenesis of intracellular bacteria**
- **Structural and functional studies of plant viruses**
- **Synthetic biology of virus-like particles**
- **Structural and functional characterization of factors involved in DNA-protein crosslink repair**

[More information](#)



Prof. dr. Gregor ANDERLUH

TOPIC 9

- **Membrane interactions and mechanism of action of microbial cytolysins**
- **Studies of interactions between proteins and membranes at the structural and functional level**
- **Synthetic biology of nanopores**

[More information](#)



Prof. dr. Nataša ZABUKOVEC LOGAR

TOPIC 10

Green synthesis of metal-organic frameworks for energy and environmental application

[More information](#)



Prof. dr. Nataša NOVAK TUŠAR

TOPIC 11

Multimetal functionalized porous materials for catalytic air purification

[More information](#)



Prof. dr. Robert DOMINKO

TOPIC 12

Artificial SEI on metal lithium

Li-ion batteries are most promising portable storage devices and their energy density can be further improved by replacement of negative electrode by metallic lithium. The latter needs to be protected if we want to avoid formation of dendrites and constant passivation. Protection layers can be based on polymers or alloys.

Modern Battery Systems

[More information](#)



Prof. dr. Simona GOLIČ GRDADOLNIK

TOPIC 13

The role of protein dynamics at the ligand-protein binding process

The aim of these studies is a site specific characterization of protein dynamic processes in ligand-protein complexes on a wide range time scale at atomic level using spectroscopic methods and molecular dynamics simulations. This is required for the proper understanding of ligand-protein binding mechanisms. In general, the anticipated results will inspire future research of the poorly explored role of dynamics and molecular flexibility in biological processes and can have direct impact on the development of novel therapeutic agents.

[More information](#)



Prof. dr. Matej Praprotnik

TOPIC 14

Multiscale modeling and simulation approaches for biomedical ultrasonic applications

Data-informed mesoscopic models of ultrasound contrast agents to accurately model their rheological and acoustic behavior that critically affects the technology of ultrasound-guided drug and gene delivery

[More information](#)



Prof. dr. Jože GRDADOLNIK

TOPIC 15

Protein aggregation monitored by vibrational spectroscopy

Infrared, micro Raman, VCD, NMR and advanced theoretical methods will be used to study the structural phase transitions of poly-L-lysine and polyglutamate induced by temperature and/or by changing the pH. The stability of peptide structure and intermediates will be tested in the presence of various types of cosolvents. Acquired knowledge from model systems will be applied in the study of amyloid aggregation of insulin, which is related to type I diabetes mellitus.

[More information](#)



Prof. dr. Samo HOČEVAR

TOPIC 16

Electrochemical Sensors

- Development of (micro)electrodes, electrochemical (bio)sensors, and gas sensors.
- Development of sensing materials and study of electrode processes.
- Development of electrochemical methodologies and application studies.

TOPIC 17

Elemental (Bio)Imaging and Chemical Characterization

- Development of 2D/3D elemental (bio)imaging using laser ablation hyphenated with elemental mass spectrometry (LA-ICP-MS).
- Development of methodologies for the analysis of trace elements and organic species in environmental, biological/biomedical and material research (ICP-OES, ICP-MS, LC-MS/MS).

TOPIC 18

Atmospheric Chemistry

- Study of chemical processes in atmospheric aerosols
- Physico-chemical characterization of size-segregated atmospheric (nano)aerosols.
- Development of novel methods for (outdoor & indoor) nanoparticle characterization and study of their transformations

[More information](#)



Prof. dr. Albin PINTAR

TOPIC 19

Visible light assisted photocatalysis for water treatment

Materials used as photocatalysts in the process of heterogeneous photocatalytic oxidation must be significantly improved in order to make this process economically attractive. In this respect, novel nanostructured and nanoshaped photocatalysts (including nanoplasmonic solids) will be developed that will allow efficient harvesting of visible light spectrum.

TOPIC 20

Direct biogas to liquid fuel conversion

Biogas (i.e. a mixture of methane and carbon dioxide) is produced by anaerobic dark fermentation of solid wastes and renewables. Multifunctional heterogeneous catalysts will be developed that will enable efficient and direct transformation of biogas to either dimethylether or methanol in a single reactor unit.

[More information](#)



Prof. dr. Franci MERZEL

TOPIC 21

Computational characterization of structural dynamics underlying function in proteins

Molecular dynamics simulations and free energy calculations are powerful biophysical tools offering spatial and temporal resolutions that can effectively complement experimental methodologies in studying molecular basis of protein function:

- How hydration water assists protein function?
- How does water pass through membrane transporters (SGLT)?

[More information](#)



**dr. Filipa Alexandra ANDRE
VICENTE**

TOPIC 22

**Sustainable downstream
processes – a circular
economy approach for
biomass valorization**

- Amino acids from waste: Integrated and biocompatible platform for protein recovery and hydrolysis
- From food waste to cosmetics: a roadmap for extraction, purification and application of essential oils
- Development of prebiotic formulations from seaweed dietary fibers

[More information](#)



dr. Alen ALBREHT

TOPIC 23

Food Chemistry

- Research in the field of functional food, food supplements, and natural biologically active compounds from plant materials.
- Development of various chromatographic and hyphenated LC, GC, TLC, CE, LC-MS, GC-MS, TLC-MS analytical methods in the frame of research projects and for other academic and industrial partners from Slovenia and abroad.

[More information](#)



dr. Matej HUŠ

TOPIC 24

Computational catalysis

We will investigate heterogeneous catalysis theoretically. Using first-principle methods, we will study i) the effect of particle size, ii) alloying, iii) doping on catalyst activity, iv) optimum catalyst search for a) ethylene epoxidation, b) CO oxidation, c) N₂ reduction or d) oxygen reduction reaction. The theoretical calculations will complement the experimental work already in progress at the department.

- Density functional theory calculations for reaction mechanisms
- Microkinetic modelling for describing kinetics
- Kinetic Monte Carlo for following surface evolution
- Molecular dynamics for dynamic properties

[More information](#)



Doc.dr. Ivan Jerman

TOPIC 25

- **Nano Coatings for Concentrated Solar Power electricity production**
- **Fire-resistant polymers**
- **Spectrally selective coatings for all temperatures e.g. applicable in solar power systems**
- **Antisticking coatings**
- **Antimicrobial, antiviral coatings**
- **Anticorrosive coatings e.g. applicable in fuel cells**

[More information](#)



Prof.dr. Gregor MALI

TOPIC 26

Development and application of solid-state NMR methods for the investigations of formation, for structure determination and for in-situ studies of the performance of porous catalysts and adsorbents.

Expertise required by the applicant: basic programming skills (e.g. C, Matlab or similar; familiarity with Linux is an advantage).

[More information](#)



dr. Elena CHERYSHOVA

TOPIC 27

Development of in-situ XPS

[More information](#)



dr. Ana Kroflič

TOPIC 28

Exploring atmospheric reactions leading to secondary organic aerosols and brown carbon formation in laboratory reaction systems: an experimental/modelling approach

[More information](#)



dr. Matjaž Mazaj

TOPIC 29

Development of porous materials for carbon capture and utilization technologies

[More information](#)



doc.dr. Petar Djinović

TOPIC 30

In situ analytical methodology for catalyst monitoring during photocatalytic conversion

[More information](#)

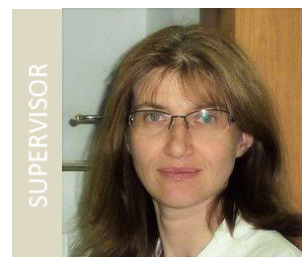


Doc. dr. Sebastijan Kovačič

TOPIC 31

Advanced organic foams for adsorption and photooxidation of water-dissolved pollutants

[More information](#)



dr. Alenka Ristić

TOPIC 32

Design of porous thermochemical sorbents for heat batteries

[More information](#)



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