# REGISTRATION FORM FOR CZECH SCIENTIFIC INSTITUTION

**1. Research institution data (name and address):**

**J. Heyrovsky Institute of Physical Chemistry, Czech Academy of Science**
Dolejškova 2155/3
182 23 Prague 8, Czech Republic

**2. Type of research institution:**

Public research institution – Czech Academy of Sciences (veřejná výzkumná instituce – Akademie věd České republiky)

**3. Head of the institution:** prof. Martin HOF, Dr. rer. nat., DSc.

**4. Contact information of designated person(s) for applicants:**

Dominika Patrovská, Secretary for Science
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Dolejškova 2155/3, 182 23 Prague 8, Czech Republic

**5. Research discipline in which the strong international position of the institution ensures establishing a Dioscuri Centre:**

**Natural Sciences and Technology:** *Physical and analytical chemical sciences* - physical chemistry/chemical physics, theoretical chemistry, analytical chemistry, inorganic chemistry, organic chemistry, method development

**6. Description of important research achievements from the selected discipline from the last 5 years including a list of the most important publications, patents, or other results:**


- Zhang, W.;Wu, Y.;Bahng, H. W.;Cao, Y.;Yi, Ch.;Saygili, Y.;Luo, J.;Liu, Y.;Kavan, Ladislav;Moser, J. E.;Hagfeldt, A.;Tian, H.;Zakeeruddin, S. M.;Zhu, W.-H.;Grätzel, M.: **Comprehensive control of voltage loss enables 11.7% efficient solid-state dye-sensitized solar cells, Breathborne Biomarkers and the Human Volatilome (Second Edition),** Energy Environ. Sci., 2018, 11, 1779-1787
- Andris, E.;Navrátil, R.;Jašík, J.;Terencio, T.;Srnec, Martin;Costas, M.;Roithová, J.: **Chasing the Evasive Fe=O Stretch and the Spin State of the Iron(IV)-Oxo Complexes by Photodissociation Spectroscopy,** J. Am. Chem. Soc. 2017, 139, 7, 2757–2765
- Andris, E.;Navrátil, R.;Jašík, J.;Srnec, Martin;Rodríguez, M.;Costas, M.;Roithová, J.: **M-O Bonding Beyond the Oxo Wall: Spectroscopy and Reactivity of Cobalt(III)-Oxyl and Cobalt(III)-Oxo Complexes,** Angew Chem Int Ed Engl., 2019 Jul 8;58(28):9619-9624.
- Steringer, J. P.;Lange, S.;Čujová, Sabína;Šachl, Radek;Poojari, C.;Lolicato, F.;Beutel, O.;Müller, H.-M.;Unger, S.;Coskun, U.;Honigmann, A.;Vattulainen, I.;Hof, Martin;Freund, Ch.;Nickel, W.: **Key steps in unconventional secretion of fibroblast growth factor 2 reconstituted with purified components,** Steringer et al. eLife 2017;6:e28985.
- Kokkonen, P.;Sýkora, Jan;Prokop, Z.;Ghose, Avisek;Bednář, D.;Amaro, Mariana;Beerens, K.;Bidmanová, Š.;Slánská, M.;Březovský, J.;Damborský, J.;Hof, Martin: **Molecular Gating of an Engineered Enzyme Captured in Real Time,** J. Am. Chem. Soc. 2018, 140, 17999−18008
- Allolio, Christoph;Magarkar, Aniket;Jurkiewicz, Piotr;Baxová, Katarína;Javanainen, Matti;Mason, Philip E.;Šachl, Radek;Cebecauer, Marek;Hof, Martin;Horinek, D.;Heinz, V.;Rachel, R.;Ziegler, C. M.;Schröfel, A.;Jungwirth, Pavel: **Arginine-rich cell-penetrating peptides induce membrane multilamellarity and subsequently enter via formation of a fusion pore,** PNAS , November 20, 2018,vol. 115, no. 47, 11923–11928
- del Corro, Elena;Peña-Álvarez, Miriam;Sato, K.;Morales-García, A.;Bouša, Milan;Mračko, Michal;Kolman, Radek;Pacáková, Barbara;Kavan, Ladislav;Kalbáč, Martin;Frank, Otakar: **Fine tuning of optical transition energy of twisted bilayer graphene via interlayer distance modulation,** Phys. Rev., 2017, B 95, 085138,
- Meissner, R.;Kočišek, J.;Feketeová, L.;Fedor, Juraj;Fárník, Michal;Limao-Vieira, P.;Illenberger, E.;Denifl, S.: **Low-energy electrons transform the nimorazole molecule into a radiosensitiser,** Nature Communications, 2019, 10:2388
- Smith, D.;Španěl, Patrik;Hanna, G. B.;Dweik, R.A.: **Selected ion flow tube mass spectrometry,** Breathborne Biomarkers and the Human Volatilome (Second Edition), Elsevier, 2020, Pages 137-153

**7. List of no more than 3 important research projects in the selected discipline awarded in national and international calls to the institution in the last 5 years:**

**ERA Chair project**

funded by European Union´s Horizon 2020

311 000 Euro

**Pro-NanoEnviCz**

funded by European Region Fund

680 000 Euro

**Electrochemical Conversion of Renewable Electricity into Fuels and Chemicals (Akronym: ELCOREL)**

funded by European Commission

312 000 Euro

**8. Description of the available laboratory and office space for a Dioscuri Centre:**

Our five-storey building offers equipped laboratories (see list below) for these specific fields of physical chemistry: Theoretical and Computational Chemistry, Spectroscopy, Biochemical Chemistry, Low-Dimensional Systems, Structure and Dynamics in Catalysis, Electrochemistry, Nanocatalysis, Chemistry of Ions in Gaseous Phase. One entire floor is used by the administration and grants department to support scientists.

**9. List of the available research equipment for a Dioscuri Centre:**

Selected ion flow tube mass spectrometer Profile 3 SIFT-MS

GC/MS FOCUS GC ITQ 700 ion trap mass spectrometer

LC/MS/MS tandem quadrupole mass spectrometer, Quattro Premier XE

SESI/MS mass spectrometer, bespoke construction

Integrated Raman spectrometer with Scanning Probe Microscopy

Advanced Atomic Force Microscopy with Quantitative Nanomechanical Mapping (QNM)

Scanning probe microscopes (AFM/STM) for scanning in ambient atmosphere, liquids and in electrochemical arrangement

Computational clusters 960, 616 and 612 CPU cores.

Cluster Deposition Apparatuses “Little Brother” and “Big Brother”

Temperature programmed reaction systems (TPR)

500 MHz MAS NMR spectrometer Bruker Avance III HD 500 WB/US NMR

UV-Vis-NIR spectrometer Perkin-Elmer Lambda 950

Four FTIR spectrometers Nexus 670 e.s.p. (Thermo Nicolet Co.)

EPR spectroscopy

NMR spectroscopy

Infrared spectroscopy (FTIR)

UV-near IR spectroscopy - Molecular spectroscopy

Polymerization autoclaves

High pressure reactors

Fluorescence spectrometer FL6500

Raman spectrometer LabRAM HR, HORIBA Jobin-Yvon

Raman spectrometer WITec alpha300 R

Attocube insert for low temperature Raman spectroscopy

Clean room laboratory for optical lithography

Chemical vapour deposition (CVD) apparatus for graphene growth

Temperature programmed desorption apparatus (TPD)

Photoelectron spectrometer ESCA system (VG).

Q-switched Nd:YAG pulsed laser Nano S60-30 (Litron Lasers)

Differential Electrochemical Mass Spectrometry (DEMS) apparatus

Field Emission Scanning Electron Microscopy (SEM) - Hitachi S4800

Powder X Ray Diffractometer - Rigaku Miniflex 600

Freeze dryer (FreeZone Triad Freeze Dry System 7400030, Labconco)

Quantitative dissociative electron attachment (DEA) spectrometer with MS

Electron energy loss spectormeter

Tunable diode laser Cavity Ring-Down Spectrometer (CRDS)

Photoacoustic spectrometer

**10. List of the additional benefits (other than listed in the conditions for hosting a DC, see invitation) that the Institution declares to provide for a Dioscuri Centre (i.e.: additional funds, personal benefits, dual career options, relocation support or other):**

25 days paid leave of absence (holidays) per year + 3 days of paid sick-leave in addition to the statutory insurance, flexible working-time, the possibility of part-time work, lunch vouchers, subsidy for sport and cultural activities, recreation subsidy, recreation subsidy for children, possibility of attending children groups of the CAS, possibility to use discounts in recreation centers of the CAS, sports goods rental, free parking, trade union library, language courses, acommodation facilities, possibility of further education and career development by participating in courses organized by our institute.

**11. Other information about the internationalization of the research institution, international researchers employed at the institution, the availability of English language seminars etc.:**

Our institute is an international research centre with a bilingual environment. 27% of our scientists are foreign researchers. Internal communications of our organization are conducted bilingually. All official documents are published in English as well as in Czech.

The institute cooperates with several partners in the international research area. This cooperation is to a large extent realised at the level of individual research teams and results in a substantial fraction of publications co-authored by international authors. Out of 1161 publications indexed in WoS the following numbers were co-authored by scientists from the following countries: 114 from Germany; 98 from England, Wales and Scotland; 86 from USA; 71 from France; 54 from Poland; 53 from Italy; 53 from Slovakia; 52 from Spain; 47 from Switzerland; 42 from Austria; 31 from Sweden; 26 from Hungary; 25 from Finland; 19 from Denmark; 19 from Russia; 17 from India; 15 from Belgium; 14 from Greece; 14 from Japan and 145 from other countries of the world. Worthy of note as institutional partners are Helmholtz Association (26 co-authored articles), Hungarian Academy of Sciences (26), University of Innsbruck (23) and CNRS institute of Chemistry (21) and Tampere University, Finland (21) amongst more than 500 collaborating institutes and universities.

Several of these collaborations are formalised by contracts signed as a part of various research projects. Projects funded by the European Commission have a prime role including the frameworks of Coordination and Support Actions (CSA), Marie Skłodowska-Curie Actions Innovative Training Networks (MSCA-ITN), Research and innovation actions (RIA) and a Framework Partnership Agreement (FPA).

In addition to the EC projects, one international project funded by the Czech Science Foundation together with the German Science Foundation (DFG) was carried out in collaboration between the Institute and the Biochemie-Zentrum (BZH) of Ruprecht-Karls-Universität Heidelberg entitled “Exploring the structure-function relationship of membrane-pore-forming FGF2 oligomers - a single molecule approach” (the principal investigator Prof. M. Hof ). Moreover, bilateral funding schemes provided by the Czech Ministery of Education were extensively used for cooperating within international research area (including USA, Germany and Israel). To strengthen collaboration with the neighbouring Saxony region of Germany, a memorandum was signed in October 2019 with Helmholtz-Zentrum Dresden-Rossendorf (HZDR).