

DC1 – Job Vacancy

Position Description	
Reference	DC1
Title of the project	Synthesis of sMMO enzyme-mimic metal-organic frameworks
Recruiting Institution	University of Oslo (Norway)
PhD jointly awarded by	University of Oslo (Norway) and University of Turin (Italy)
Additional secondment	ProfMOF
Expected Start Date	01-11-2023
Job Offer Description	
Keywords	<ul style="list-style-type: none"> - materials synthesis - porous materials - enzyme-mimic moieties - internal surface functionalization - advanced characterisation - synthesis scale-up
Project Description	<p>The main aim of the DC project is to develop synthetic procedures for sMMO-mimicking heterogenised catalytically active moieties, consisting of mono- and/or binuclear iron sites integrated onto the internal surfaces of metal-organic frameworks.</p> <p>Secondly, approaches will be established to adapt the above-developed routes for large, semi-industrial scale production.</p> <p>Finally, the heterogenised enzyme-mimicking catalysts will be thoroughly characterised using both materials, and advanced spectroscopic (both <i>ex-situ</i> and <i>operando</i>) methods to understand the underlying structure-composition relationships and eventually relate them to performance characteristics.</p> <p>In order to meet the above goals, the successful candidate will closely work with other DCs, particularly with those whose projects are focussed on catalyst performance testing as well as on developing fundamental understanding and <i>in-silico</i> procedures to catalyst design and optimisation.</p>
Objectives	<p>Science</p> <ol style="list-style-type: none"> 1) Develop synthesis protocols to produce mono- and di-Fe sites coordinated to 2 or 4 N species being part of a ligand with dicarboxylic acid end groups; 2) Incorporate the synthesised complexes into UiO-66 or UiO-67 Zr-MOFs by post-synthetic linker exchange/grafting; 3) Characterise the synthesised complexes using Nuclear Magnetic Resonance (NMR), Mass Spectrometry (MS) and X-Ray Diffraction (XRD); 4) Characterise MOF features via XRD, N₂ physisorption (BET), Thermogravimetric Analysis (TGA), Scanning Electron Microscopy (SEM). <p>Training</p> <ol style="list-style-type: none"> 1) hands-on training on synthesis and characterisation related to MOF linker exchange (UIO); 2) Scale-up procedures for Zr-based MOFs (developed at ProfMOF); 3) <i>Ex-situ</i> and <i>operando</i> spectroscopy (UV-VIS, IR, Raman) to unravel redox behaviour and stability of active sites (TUR); 4) Additional technical and TS training network-wide.



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Expected Results	<p>1) Synthesis protocols for two classes of MOFs:</p> <p>a) UiO-66/67 based Zr-MOFs with incorporation of N₂-N₄ coordinated mono- and di-nuclear Fe complexes;</p> <p>b) large-pore MOFs for enzyme embedding.</p> <p>2) Synthesis of gram-scale MOF samples for further characterisation and testing and sharing within the consortium.</p>
PhD Supervisors	<p>Main supervisor: Assoc. Prof. Petra Ágota Szilágyi (University of Oslo, Norway)</p> <p>Co-supervisor: Prof. Silvia Bordiga (University of Turin, Italy)</p> <p>Secondment: Professor Karl-Petter Lillerud (ProfMOF, Norway)</p>
Vacancy requirements	
Qualifications	<p>Master's degree or equivalent in materials science, chemistry, or chemical engineering from a Norwegian institution, or a foreign completed degree (M.Sc.-level) corresponding to a minimum of four years in the Norwegian educational system</p>
Requirements	<p>Solid knowledge of inorganic chemistry/materials science.</p> <p>The grade requirements of the position are as follows: the average grade point for courses included in the Bachelor's degree must be equivalent to C or better in the Norwegian educational system the average grade point for courses included in the Master's degree must be equivalent to B or better in the Norwegian educational system; the Master's thesis must have the equivalent to grade B or better in the Norwegian educational system.</p> <p>The position's subject area may require licensing under the Norwegian Export Control Act. In order to be considered for the position, it is a prerequisite that UiO must be able to be granted such licence. https://www.uio.no/english/studies/admission/master/export-control.html</p>
Languages	<p>Demonstrated fluency in English.</p> <p>Details of English-language requirements for applicants from non-EU/EEA countries and exemptions from the requirements can be found here: https://www.mn.uio.no/english/research/phd/regulations/regulations.html#toc8</p>
Skills	<p>Ability to conduct high-quality independent research within a broad collaboration;</p> <p>Interpersonal communication skills and the ability to work as part of a team;</p> <p>Self-motivation, creativity, genuine curiosity about the subject, work discipline, professional ethics, and ambition.</p>
Experience	<p>Practical experience with the synthesis of transition-metal complexes and/or metal-organic compounds;</p> <p>Practical experience with materials synthesis and basic characterisation (NMR, FTIR spectroscopies, surface area measurements, X-ray diffraction, etc.);</p> <p>Experience with porous material preparation and functionalisation techniques (i.e. metal-organic frameworks);</p> <p>Familiarity with advanced catalyst characterisation (e.g. X-ray spectroscopies, electron microscopy);</p> <p>Understanding of industrial process requirements</p>



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Job Details	
Salary	Salary follows the rules in Marie Skłodowska-Curie Actions Work Programme. Salary NOK 532 200 – 575 400 per annum, depending on qualifications in a position as PhD Research fellow (position code 1017).
Other benefits	Other benefits: Gross family allowance: 495 € per month - if applicable* *The family allowance will also be made available to researchers whose parental status changes during their project.
Duration	36 months
Type of contract	Full time
Place of work	University of Oslo (Norway, 17 months) University of Turin (Italy, 12 months) ProfMOF (Norway, 7 months)