FWO DMP Template - Flemish Standard Data Management Plan

Version KU Leuven

Project supervisors (from application round 2018 onwards) and fellows (from application round 2020 onwards) will, upon being awarded their project or fellowship, be invited to develop their answers to the data management related questions into a DMP. The FWO expects a **completed DMP no later than 6 months after the official start date** of the project or fellowship. The DMP should not be submitted to FWO but to the research co-ordination office of the host institute; FWO may request the DMP in a random check.

At the end of the project, the **final version of the DMP** has to be added to the final report of the project; this should be submitted to FWO by the supervisor-spokesperson through FWO's e-portal. This DMP may of course have been updated since its first version. The DMP is an element in the final evaluation of the project by the relevant expert panel. Both the DMP submitted within the first 6 months after the start date and the final DMP may use this template.

The DMP template used by the Research Foundation Flanders (FWO) corresponds with the Flemish Standard Data Management Plan. This Flemish Standard DMP was developed by the Flemish Research Data Network (FRDN) Task Force DMP which comprises representatives of all Flemish funders and research institutions. This is a standardized DMP template based on the previous FWO template that contains the core requirements for data management planning. To increase understanding and facilitate completion of the DMP, a standardized **glossary** of definitions and abbreviations is available via the following link.

1. General Project Information	
Name Grant Holder & ORCID	**Full name: Thi Hong Trang Nguyen. ORCID: 0000-0002-2576-4133**
Contributor name(s) (+ ORCID) & roles	**Promotor: Ewald Janssens. ORCID: 0000-0002-5945-1194**
Project number [1] & title	Project number: 12ZZI23N Title: Plasmon-enhanced CO2 electroreduction based on metal oxide inverse opal supports decorated with bimetallic nanoparticles
Funder(s) GrantID [2]	200804
Affiliation(s)	☒ KU Leuven ☐ Universiteit Antwerpen ☐ Universiteit Gent ☐ Universiteit Hasselt ☐ Vrije Universiteit Brussel ☐ Other: ROR identifier KU Leuven: 05f950310

[1] "Project number" refers to the institutional project number. This question is optional. Applicants can only provide one project number.

[2] Funder(s) GrantID refers to the number of the DMP at the funder(s), here one can specify multiple GrantIDs if multiple funding sources were used.

Please provide a short project description	In this project, we propose an original and novel approach for electrocatalytic CO2 reduction (eCO2RR) using the physical method of cluster beam deposition of bimetallic nanoparticles onto a C-CoOx inverse opal support. Exploiting the exceptional size and composition control of cluster sources may enable the identification of novel high-performance eCO2RR by means of a combination of structural, spectroscopic, and reactivity experiments. We will test the applicability of mono- and bimetallic gold-copper nanoparticles for the direct electrochemical reduction of CO2 into methanol and C2 products (ethanol, ethylene, etc.). We will investigate the reactivity, selectivity, and stability of novel model catalysts based on Cu-Au nanometer particles from 2 to 5 nm, deposited on the C-CoOx support. Comparing the properties of the plasmonic nanoclusters with various light irradiation conditions and applied potentials may allow understanding plasmon-enhanced eCO2RR (PEeCO2RR) mechanisms. A combination of the experiments on basic material characteristics (morphology, structure, and electronic properties) with (photo)electrocatalytic characterizations will contribute to a better understanding of the structure-activity relationship in plasmonic electrocatalysts that will enable the identification of novel high-performance electrocatalysts. The overall research objective is to design advanced electrocatalysts for CO2 reduction by getting insight into the influence of the size, elemental composition, morphology, and the interaction with the metal oxide support as well as to investigate PEeCO2RR in these materials.

2. Research Data Summary

List and describe all datasets or research materials that you plan to generate/collect or reuse during your research project. For each dataset or data type (observational, experimental etc.), provide a short name & description (sufficient for yourself to know what data it is about), indicate whether the data are newly generated/collected or reused, digital or physical, also indicate the type of the data (the kind of content), its technical format (file extension), and an estimate of the upper limit of the volume of the data [3].

				ONLY FOR DIGITAL DATA	ONLY FOR DIGITAL DATA	ONLY FOR DIGITAL DATA	ONLY FOR PHYSICAL DATA
Dataset Name	Description	New or Reused	Digital or Physical	Digital Data Type	Digital Data Format	Digital Data Volume (MB, GB, TB)	Physical Volume
		☐ Generate new data ☐ Reuse existing data	☐ Digital ☐ Physical	☐ Audiovisual ☐ Images ☐ Sound ☐ Numerical ☐ Textual ☐ Model ☐ Software ☐ Other:		☐ < 1 GB ☐ < 100 GB ☐ < 1 TB ☐ < 5 TB ☐ > 5 TB ☐ NA	
Samples	Cluster-based electrocatalysts in the gas phase C-Co3O4/AuxCu1-x	New data	Physical				01.13 at 200D, QSP
Lab books	Written details about the different process trials, results, and observations	New data	Physical				1 drawer
Mass spectra	Time-of-flight mass	New data	Digital	Images, Numerical, Textual	.txt .csv .pdf	< 100 GB	

	spectrometry measurements						
SEM, TEM, XPS, XRD, EDX, EXAFT	Material characterization	New data	Digital	Images, Numerical, Textual	.txt .csv .pdf .xlsx	< 100 GB	
LSV, CV, EIS, chronoamperometry	Plasmon-enhanced electrochemical measurements	New data	Digital	Images, Numerical, Textual	.cor .z60 .txt .xlsx .pdf	< 100 GB	
GC and HPLC measurements	Gas and liquid product analytic measurements of CO_2 reduction	New data	Digital	Images, Numerical, Textual	.dat .txt .csv .xlsx .pdf	< 100 GB	
Processed and analyzed experimental data	Data use for (or resulting from) data analysis	New data	Digital	Images, Numerical, Textual Origin 2021, QtiPlot	.dat .txt .csv .opju .qti .pdf	< 100 GB	
Electronic lab logbooks	Written details about the different process trials, experimental conditions, and observations	New data	Digital	Images, Textual	.txt .xlsx	< 1 GB	

[3] Add rows for each dataset you want to describe.

GUIDANCE: *The data description forms the basis of your entire DMP, so make sure it is detailed and complete. It includes digital and physical data and encompasses the whole spectrum ranging from raw data to processed and analysed data including analysis scripts and code. Physical data are all materials that need proper management because they are valuable, difficult to replace and/or ethical issues are associated. Materials that are not considered data in an RDM context include your own manuscripts, theses and presentations; documentation is an integral part of your datasets and should described under documentation/metadata.* *RDM Guidance on data*	
If you reuse existing data, please specify the source, preferably by using a persistent identifier (e.g. DOI, Handle, URL etc.) per dataset or data type.	Not applicable
Are there any ethical issues concerning the creation and/or use of the data (e.g. experiments on humans or animals, dual use)? If so, refer to specific datasets or data types when appropriate and provide the relevant ethical approval number.	☐ Yes, human subject data; provide SMEC or EC approval number: ☐ Yes, animal data; provide ECD reference number: ☐ Yes, dual use; provide approval number: ☒ No Additional information:
Will you process personal data[4]? If so, please refer to specific datasets or data types when appropriate and provide the KU Leuven or UZ Leuven privacy register number (G or S number).	☐ Yes (provide PRET G-number or EC S-number below) ☒ No Additional information:
Does your work have potential for commercial valorization (e.g. tech transfer, for example spin-offs, commercial exploitation, …)? If so, please comment per dataset or data type where appropriate.	☐ Yes ☒ No If yes, please comment:

[4] See Glossary Flemish Standard Data Management Plan

Do existing 3rd party agreements restrict exploitation or dissemination of the data you (re)use (e.g. Material/Data transfer agreements, research collaboration agreements)? If so, please explain to what data they relate and what restrictions are in place.	☐ Yes ☒ No If yes, please explain:
Are there any other legal issues, such as intellectual property rights and ownership, to be managed related to the data you (re)use? If so, please explain to what data they relate and which restrictions will be asserted.	☐ Yes ☒ No If yes, please explain:

3. Documentation and Metadata	
Clearly describe what approach will be followed to capture the accompanying information necessary to keep **data understandable and usable**, for yourself and others, now and in the future (e.g. in terms of documentation levels and types required, procedures used, Electronic Lab Notebooks, README.txt files, Codebook.tsv etc. where this information is recorded). *RDM guidance on documentation and metadata*.	• For each experiment, a detailed (electronic) logbook will be used (different logbooks for the different experimental setups). These logbooks will contain the date, a brief description of the performed experiment, the parameters used for each measurement, as well as the names of all the saved files. The names of the files will be structured in a comprehensible way: system studied/date/main parameters used. • In addition, data will be stored in a folder per experimental setup, the type of investigated system and the corresponding date. In this way, by tracking the corresponding logbook notes, each file can be easily found on the local computers controlling the setup and on the server of the laboratory. • The analysis files will contain notes describing the analysis procedure and mention which original data files are included. A readme file describing the goal of the experiment and the analysis procedure will be stored in the folder where the data is saved.

Will a metadata standard be used to make it easier to **find and reuse the data**? If so, please specify which metadata standard will be used. If not, please specify which metadata will be created to make the data easier to find and reuse. *REPOSITORIES COULD ASK TO DELIVER METADATA IN A CERTAIN FORMAT, WITH SPECIFIED ONTOLOGIES AND VOCABULARIES, I.E. STANDARD LISTS WITH UNIQUE IDENTIFIERS.*	☐ Yes ☒ No If yes, please specify (where appropriate per dataset or data type) which metadata standard will be used: If no, please specify (where appropriate per dataset or data type) which metadata will be created: In this research field, there is no formal metadata standard. However, the standardized steps described above will ensure that the data is easy to find and reuse.

4. Data Storage & Back-up during the Research Project	
Where will the data be stored? *Consult the interactive KU Leuven storage guide to find the most suitable storage solution for your data.*	☒ Shared network drive (J-drive) ☒ Personal network drive (I-drive) that is synchronized with OneDrive-KU Leuven ☒ OneDrive (KU Leuven) ☐ Sharepoint online ☐ Sharepoint on-premis ☐ Large Volume Storage ☐ Digital Vault ☐ Other:
How will the data be backed up? *WHAT STORAGE AND BACKUP PROCEDURES WILL BE IN PLACE TO PREVENT DATA LOSS?*	☒ Standard back-up provided by KU Leuven ICTS for my storage solution ☒ Personal back-ups I make (that are synchronized with OneDrive-KU Leuven) ☐ Other (specify)

Is there currently sufficient storage & backup capacity during the project? If yes, specify concisely. If no or insufficient storage or backup capacities are available, then explain how this will be taken care of.	☒ Yes ☐ No If no, please specify:
How will you ensure that the data are securely stored and not accessed or modified by unauthorized persons? *CLEARLY DESCRIBE THE MEASURES (IN TERMS OF PHYSICAL SECURITY, NETWORK SECURITY, AND SECURITY OF COMPUTER SYSTEMS AND FILES) THAT WILL BE TAKEN TO ENSURE THAT STORED AND TRANSFERRED DATA ARE SAFE.* *Guidance on security for research data*	The data will be systematically transferred to the local server, with restricted access (managed by the IT responsible). Only the promotor and involved researchers have access to the shared folders where the data, analysis files, and reports will be stored. Also, credentials are required to log in to local computers in the laboratories.
What are the expected costs for data storage and backup during the research project? How will these costs be covered?	The costs are small. The departmental IT plan that is being rolled out will for each researcher cover a basic amount of data storage. Since data volumes in this project are not large, they are expected to fall within the offered amount.

5. Data Preservation after the end of the Research Project

Which data will be retained for at least five years (or longer, in agreement with other retention policies that are applicable) after the end of the project? In case some data cannot be preserved, clearly state the reasons for this (e.g. legal or contractual restrictions, storage/budget issues, institutional policies...). *Guidance on data preservation*	☒ All data will be preserved for 10 years according to KU Leuven RDM policy ☐ All data will be preserved for 25 years according to CTC recommendations for clinical trials with medicinal products for human use and for clinical experiments on humans ☐ Certain data cannot be kept for 10 years (explain)
Where will these data be archived (stored and curated for the long-term)? *Dedicated data repositories are often the best place to preserve your data. Data not suitable for preservation in a repository can be stored using a KU Leuven storage solution, consult the interactive KU Leuven storage guide.*	☐ KU Leuven RDR ☐ Large Volume Storage (longterm for large volumes) ☒ Shared network drive (J-drive) ☒ Other (specifiy): Lab books will be stored in dedicated cabinets in the laboratories. Digital data will be retained in local data storage facilities. Physical samples used will be stored in lab 01.13.
What are the expected costs for data preservation during the expected retention period? How will these costs be covered?	The cost for data preservation during the retention period are comparable to the cost for storage and backup during the project. The same conditions apply.

6. Data Sharing and Reuse

Will the data (or part of the data) be made available for reuse after/during the project? Please explain per dataset or data type which data will be made available. *NOTE THAT 'AVAILABLE' DOES NOT NECESSARILY MEAN THAT THE DATA SET BECOMES OPENLY AVAILABLE, CONDITIONS FOR ACCESS AND USE MAY APPLY. AVAILABILITY IN THIS QUESTION THUS ENTAILS BOTH OPEN & RESTRICTED ACCESS. FOR MORE INFORMATION: HTTPS://WIKI.SURFNET.NL/DISPLAY/STANDARDS/INFO-EU-REPO/#INFOEUREPO-ACCESSRIGHTS*	☐ Yes, as open data ☐ Yes, as embargoed data (temporary restriction) ☐ Yes, as restricted data (upon approval, or institutional access only) ☐ No (closed access) ☒ Other, please specify: Depending on each specific research result, we will consider the option to make the data available as open data on RDR or another platform. This particularly makes sense for analyzed data like mass spectra, and reaction kinetics data. Data that is not made available as open data, will be made available if requested by the editor or publisher of a scientific journal or upon request of an individual (e.g. a researcher who intends to reproduce an experiment).
If access is restricted, please specify who will be able to access the data and under what conditions.	In a restricted access depository. Upon request and after the agreement of the project's PIs, all data can be made available on an open repository, for example, if requested by the editor or publisher of a scientific journal or via restricted access upon request of an individual (e.g. a researcher who intends to reproduce an experiment).
Are there any factors that restrict or prevent the sharing of (some of) the data (e.g. as defined in an agreement with a 3rd party, legal restrictions)? Please explain per dataset or data type where appropriate.	☐ Yes, privacy aspects ☐ Yes, intellectual property rights ☐ Yes, ethical aspects ☐ Yes, aspects of dual use ☐ Yes, other ☒ No If yes, please specify:
Where will the data be made available? If already known, please provide a repository per dataset or data type.	☒ KU Leuven RDR ☐ Other data repository (specify) ☐ Other (specify)

When will the data be made available?	☐ Upon publication of research results ☐ Specific date (specify) ☒ Other (specify) Upon publication of research results and after agreement of the involved PIs (with a possible embargo time no longer than one year after the publication of the research)
Which data usage licenses are you going to provide? If none, please explain why. *A DATA USAGE LICENSE INDICATES WHETHER THE DATA CAN BE REUSED OR NOT AND UNDER WHAT CONDITIONS. IF NO LICENCE IS GRANTED, THE DATA ARE IN A GREY ZONE AND CANNOT BE LEGALLY REUSED. DO NOTE THAT YOU MAY ONLY RELEASE DATA UNDER A LICENCE CHOSEN BY YOURSELF IF IT DOES NOT ALREADY FALL UNDER ANOTHER LICENCE THAT MIGHT PROHIBIT THAT.* *Check the RDR guidance on licences for data and software sources code or consult the License selector tool to help you choose.*	☐ CC-BY 4.0 (data) ☐ Data Transfer Agreement (restricted data) ☐ MIT licence (code) ☐ GNU GPL-3.0 (code) ☒ Other (specify) This is not decided yet and will be discussed case by case, but most likely we will opt for a CC-BY 4.0 license.
Do you intend to add a PID/DOI/accession number to your dataset(s)? If already available, please provide it here. *INDICATE WHETHER YOU INTEND TO ADD A PERSISTENT AND UNIQUE IDENTIFIER IN ORDER TO IDENTIFY AND RETRIEVE THE DATA.*	☒ Yes, a PID will be added upon deposit in a data repository ☐ My dataset already has a PID ☐ No
What are the expected costs for data sharing? How will these costs be covered?	The cost of sharing is expected to be zero or low. In case there is a cost, it will be covered by working budget of the project.

7. Responsibilities	
Who will manage data documentation and metadata during the research project?	Researcher who collects data within the project, according to the standards that have been agreed upon
Who will manage data storage and backup during the research project?	Data storage and backup is managed by the departmental IT
Who will manage data preservation and sharing?	Data preservation is managed by departmental IT. Data sharing falls under the responsibility of the PI
Who will update and implement this DMP?	The grant holder of the project is responsible for the updating and implementation of this DMP.