

## 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	<b>Xiaoyu Tan 0000-0001-7146-1718</b>
Contributor name(s) (+ ORCID) & roles	<b>Ivo Vankelecom <a href="#">0000-0002-0104-9493</a> &amp; promotor</b> <b>Laurens Rutgeerts <a href="#">0000-0002-1809-3722</a> &amp; colleague</b>
Project number <sup>1</sup> & title	<b>(12A8X25N)Ultra-high-performance zeolite-filled membranes for gas and liquid separations</b>
Funder(s) GrantID <sup>2</sup>	<b>12A8X25N</b>
Affiliation(s)	<input checked="" type="checkbox"/> KU Leuven <input type="checkbox"/> Universiteit Antwerpen <input type="checkbox"/> Universiteit Gent <input type="checkbox"/> Universiteit Hasselt <input type="checkbox"/> Vrije Universiteit Brussel <input type="checkbox"/> Other: ROR identifier KU Leuven: 05f950310
Please provide a short project description	<p>An ultra-high performance zeolite-filled mixed matrix membrane (MMM) was published in “Science” by the applicant recently. This novel membrane integrates excellent selectivity/permeability performance, robustness, anti-aging, moisture-resistance, easy-processing and handling properties in one single material, and outperforms all reported membranes by orders of magnitude. This MMM platform exhibits tunable and unprecedented performance for valuable energy-intensive gas separations, such as CO<sub>2</sub>/CH<sub>4</sub>, CO<sub>2</sub>/N<sub>2</sub>, separations for natural gas/biogas purification and flue-gas treatment, N<sub>2</sub>/hydrocarbons separation for hydrocarbon recovery, H<sub>2</sub>/CH<sub>4</sub> separations,... Based on these breakthroughs, the applicant aims to (1) further develop a novel thin-film nanocomposite membrane (TFN) which consists of an ultra-permeable, selective zeolite-filled MMM top-layer supported by a flexible polymeric substrate and (2) extend this membrane platform to various critical liquid and gas separations. Ultimately, a roll-to-roll membrane preparation strategy will be developed to scale up the advanced TFN, hence allow industrial applications.</p>

<sup>1</sup> “Project number” refers to the institutional project number. This question is optional. Applicants can only provide one project number.

<sup>2</sup> 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.



## 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 <sup>3</sup>.

Dataset Name	Description	New or Reused	Digital or Physical	ONLY FOR DIGITAL DATA	ONLY FOR DIGITAL DATA	ONLY FOR DIGITAL DATA	ONLY FOR PHYSICAL DATA
				Digital Data Type	Digital Data Format	Digital Data Volume (MB, GB, TB)	Physical Volume
Lab book notes	Observations and description of the practical execution of experiments	<input checked="" type="checkbox"/> Generate new data <input type="checkbox"/> Reuse existing data	<input type="checkbox"/> Digital <input checked="" type="checkbox"/> Physical	<input type="checkbox"/> Audiovisual <input type="checkbox"/> Images <input type="checkbox"/> Sound <input type="checkbox"/> Numerical <input checked="" type="checkbox"/> Textual <input type="checkbox"/> Model <input type="checkbox"/> Software <input type="checkbox"/> Other:	/	<input type="checkbox"/> < 1 GB <input type="checkbox"/> < 100 GB <input type="checkbox"/> < 1 TB <input type="checkbox"/> < 5 TB <input type="checkbox"/> > 5 TB <input type="checkbox"/> NA	+/- 3 books
Experimental	Description of the experimental procedures used to execute the experiments (including membrane synthesis parameters, description of the used materials,...)	<input checked="" type="checkbox"/> Generate new data	<input checked="" type="checkbox"/> Digital	<input checked="" type="checkbox"/> Audiovisual <input checked="" type="checkbox"/> Images <input checked="" type="checkbox"/> Numerical <input checked="" type="checkbox"/> Textual	.xls .docx .jpg .mp4	<input checked="" type="checkbox"/> < 1 TB	/
Microscopy images	SEM, TEM, AFM and other microscopy images	<input checked="" type="checkbox"/> Generate new data	<input checked="" type="checkbox"/> Digital	<input type="checkbox"/> Audiovisual <input checked="" type="checkbox"/> Images	.tif	<input checked="" type="checkbox"/> < 5 TB	/

<sup>3</sup> Add rows for each dataset you want to describe.

HTGS Results	Results of high-throughput gas separation experiments	<input checked="" type="checkbox"/> Generate new data	<input checked="" type="checkbox"/> Digital	<input checked="" type="checkbox"/> Numerical <input checked="" type="checkbox"/> Textual	. xlsx . csv	<input checked="" type="checkbox"/> < 5 TB	/
TGA and DSC data	Output of thermogravimetric analysis and differential scanning calorimetry experiments	<input checked="" type="checkbox"/> Generate new data	<input checked="" type="checkbox"/> Digital	<input checked="" type="checkbox"/> Numerical	. xlsx	<input checked="" type="checkbox"/> < 100 GB	/
IR spectra	Results of Fourier-transform and Raman infrared spectroscopy experiments	<input checked="" type="checkbox"/> Generate new data	<input checked="" type="checkbox"/> Digital	<input checked="" type="checkbox"/> Numerical	. xlsx	<input checked="" type="checkbox"/> < 100 GB	/
UV-vis	Results of UV-vis spectroscopy	<input checked="" type="checkbox"/> Generate new data	<input checked="" type="checkbox"/> Digital	<input checked="" type="checkbox"/> Numerical	. xlsx	<input checked="" type="checkbox"/> < 100 GB	/
XRD	Results of X-ray diffraction analysis	<input checked="" type="checkbox"/> Generate new data	<input checked="" type="checkbox"/> Digital	<input checked="" type="checkbox"/> Numerical	. xlsx	<input checked="" type="checkbox"/> < 100 GB	/
PALS	Results of Positron annihilation lifetime spectroscopy	<input checked="" type="checkbox"/> Generate new data	<input checked="" type="checkbox"/> Digital	<input checked="" type="checkbox"/> Numerical	. xlsx	<input checked="" type="checkbox"/> < 100 GB	/
Viscometry	Results of viscosity measurements	<input checked="" type="checkbox"/> Generate new data	<input checked="" type="checkbox"/> Digital	<input checked="" type="checkbox"/> Numerical	. xlsx	<input checked="" type="checkbox"/> < 100 GB	/
TEA	Results of the techno-economic analysis	<input checked="" type="checkbox"/> Generate new data	<input checked="" type="checkbox"/> Digital	<input checked="" type="checkbox"/> Numerical	. xlsx . docx	<input checked="" type="checkbox"/> < 100 GB	/
Literature	Scientific papers, reviews,...	<input checked="" type="checkbox"/> Reuse existing data	<input checked="" type="checkbox"/> Digital	<input checked="" type="checkbox"/> Textual	. pdf	<input checked="" type="checkbox"/> < 100 GB	/

<p><b>GUIDANCE:</b>  <i>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 be described under documentation/metadata.</i></p> <p><a href="#">RDM Guidance on data</a></p>	
<p>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.</p>	<p>N.A.</p>
<p>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.</p>	<p> <input type="checkbox"/> Yes, human subject data; provide SMEC or EC approval number:  <input type="checkbox"/> Yes, animal data; provide ECD reference number:  <input type="checkbox"/> Yes, dual use; provide approval number:  <input checked="" type="checkbox"/> No            Additional information:         </p>
<p>Will you process personal data<sup>4</sup>? 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).</p>	<p> <input type="checkbox"/> Yes (provide PRET G-number or EC S-number below)  <input checked="" type="checkbox"/> No            Additional information:         </p>
<p>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.</p>	<p> <input checked="" type="checkbox"/> Yes  <input type="checkbox"/> No            New membrane synthesis conditions or membrane chemistries/compositions could prove valuable to patent for the desired application. Herein, the protocols for preparing these materials will be patented before sharing the data.         </p>

<sup>4</sup> 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.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> 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.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If yes, please explain:

3. Documentation and Metadata	
Clearly describe what approach will be followed to capture the accompanying information necessary to keep <b>data understandable and usable</b> , 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).  <a href="#">RDM guidance on documentation and metadata.</a>	<b>Data is linked to experimental sections (word files), which describe how the data is generated and processed. These files are linked to the corresponding data files via an index file (excel file).</b>

<p>Will a metadata standard be used to make it easier to <b>find and reuse the data</b>?</p> <p>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.</p> <p><i>REPOSITORIES COULD ASK TO DELIVER METADATA IN A CERTAIN FORMAT, WITH SPECIFIED ONTOLOGIES AND VOCABULARIES, I.E. STANDARD LISTS WITH UNIQUE IDENTIFIERS.</i></p>	<p><input type="checkbox"/> Yes  <input checked="" type="checkbox"/> No</p> <p>If yes, please specify (where appropriate per dataset or data type) which metadata standard will be used:</p> <p>If no, please specify (where appropriate per dataset or data type) which metadata will be created:</p> <p>An excel file will be provided, which links each data file to the purpose, the experiment which generated it and the place where it is stored.</p>
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4. Data Storage & Back-up during the Research Project	
<p>Where will the data be stored?</p> <p><i>Consult the <a href="#">interactive KU Leuven storage guide</a> to find the most suitable storage solution for your data.</i></p>	<p> <input type="checkbox"/> Shared network drive (J-drive)  <input type="checkbox"/> Personal network drive (I-drive)  <input type="checkbox"/> Teams  <input type="checkbox"/> Sharepoint online  <input type="checkbox"/> Sharepoint on-premis  <input checked="" type="checkbox"/> Large Volume Storage  <input type="checkbox"/> ManGO  <input type="checkbox"/> Digital vault  <input type="checkbox"/> Other: OneDrive (KU Leuven) </p> <p>All project data will always be saved in (Shared) OneDrive folders.  These folders will be backed-up every 3 months on the Archive drive K</p>



<p>How will the data be backed up?</p> <p><i>WHAT STORAGE AND BACKUP PROCEDURES WILL BE IN PLACE TO PREVENT DATA LOSS?</i></p>	<p><input type="checkbox"/> Standard back-up provided by KU Leuven ICTS for my storage solution</p> <p><input checked="" type="checkbox"/> Personal back-ups I make (specify)</p> <p><input type="checkbox"/> Other (specify)</p> <p>The back-ups are organized internally in the research group for all data.</p>
<p>Is there currently sufficient storage &amp; 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.</p>	<p><input checked="" type="checkbox"/> Yes</p> <p><input type="checkbox"/> No</p> <p>If no, please specify:</p>
<p>How will you ensure that the data are securely stored and not accessed or modified by unauthorized persons?</p> <p><i>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.</i></p> <p><a href="#"><u>Guidance on security for research data</u></a></p>	<p>The lab notes and work laptop are stored in a locked cupboard in the researcher's office. The office is located in a badge-restricted area of the building, and is locked if no one is inside.</p> <p>The laptop is secured with a password and access to double authentication is required to access the KUL One Drive system from other devices.</p> <p>No very sensitive data will be generated, therefore no extra security (encryption of the computer) is foreseen at this stage.</p>
<p>What are the expected costs for data storage and backup during the research project? How will these costs be covered?</p>	<p>The internal storage costs are estimated to be 50 euro per TB for backup on the internal servers. OneDrive is provided by KU Leuven for free.</p>

## 5. Data Preservation after the end of the Research Project

<p>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...).</p> <p><a href="#">Guidance on data preservation</a></p>	<p><input checked="" type="checkbox"/> All data will be preserved for 10 years according to KU Leuven RDM policy</p> <p><input type="checkbox"/> 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</p> <p><input type="checkbox"/> Certain data cannot be kept for 10 years (explain)</p>
<p>Where will these data be archived (stored and curated for the long-term)?</p> <p><i><a href="#">Dedicated data repositories</a> 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 <a href="#">interactive KU Leuven storage guide</a>.</i></p>	<p><input type="checkbox"/> KU Leuven RDR</p> <p><input checked="" type="checkbox"/> Large Volume Storage (longterm for large volumes)</p> <p><input type="checkbox"/> Shared network drive (J-drive)</p> <p><input type="checkbox"/> Other (specify):</p>
<p>What are the expected costs for data preservation during the expected retention period? How will these costs be covered?</p>	<p><b>The costs for long term data storage are 50 euro per TB per year.</b></p>

## 6. Data Sharing and Reuse

<p>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.</p> <p><i>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 &amp; RESTRICTED ACCESS. FOR MORE INFORMATION:</i></p> <p><a href="https://wiki.surfnet.nl/display/STANDARDS/INFO-EU-REPO/#INFO-EUROPE-ACCESSRIGHTS">https://wiki.surfnet.nl/display/STANDARDS/INFO-EU-REPO/#INFO-EUROPE-ACCESSRIGHTS</a></p>	<p> <input type="checkbox"/> Yes, as open data  <input type="checkbox"/> Yes, as embargoed data (temporary restriction)  <input checked="" type="checkbox"/> Yes, as restricted data (upon approval, or institutional access only)  <input type="checkbox"/> No (closed access)  <input type="checkbox"/> Other, please specify:         </p>
<p>If access is restricted, please specify who will be able to access the data and under what conditions.</p>	<p>All researchers and PI will have access at all time to the data. Externals can get access to the data upon approval of the PI.</p>
<p>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.</p>	<p> <input type="checkbox"/> Yes, privacy aspects  <input type="checkbox"/> Yes, intellectual property rights  <input type="checkbox"/> Yes, ethical aspects  <input type="checkbox"/> Yes, aspects of dual use  <input type="checkbox"/> Yes, other  <input checked="" type="checkbox"/> No         </p> <p>If yes, please specify:</p>
<p>Where will the data be made available? If already known, please provide a repository per dataset or data type.</p>	<p> <input checked="" type="checkbox"/> KU Leuven RDR  <input type="checkbox"/> Other data repository (specify)  <input type="checkbox"/> Other (specify)         </p>

When will the data be made available?	<input checked="" type="checkbox"/> Upon publication of research results <input type="checkbox"/> Specific date (specify) <input type="checkbox"/> Other (specify)
Which data usage licenses are you going to provide? If none, please explain why.  <i>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.</i> Check the <a href="#">RDR guidance on licences</a> for data and software sources code or consult the <a href="#">License selector tool</a> to help you choose.	<input type="checkbox"/> CC-BY 4.0 (data) <input checked="" type="checkbox"/> Data Transfer Agreement (restricted data) <input type="checkbox"/> MIT licence (code) <input type="checkbox"/> GNU GPL-3.0 (code) <input type="checkbox"/> Other (specify)
Do you intend to add a PID/DOI/accession number to your dataset(s)? If already available, please provide it here.  <i>INDICATE WHETHER YOU INTEND TO ADD A PERSISTENT AND UNIQUE IDENTIFIER IN ORDER TO IDENTIFY AND RETRIEVE THE DATA.</i>	<input type="checkbox"/> Yes, a PID will be added upon deposit in a data repository <input type="checkbox"/> My dataset already has a PID <input checked="" type="checkbox"/> No
What are the expected costs for data sharing? How will these costs be covered?	<b>KU Leuven RDR free for 50 GB, this should cover the total amount of data generated during this project.</b>

7. Responsibilities	
Who will manage data documentation and metadata during the research project?	<b>Xiaoyu Tan</b>

Who will manage data storage and backup during the research project?	<b>Laurens Rutgeerts</b>
Who will manage data preservation and sharing?	<b>Laurens Rutgeerts</b> <b>Annelies Vanvlasselaer</b>
Who will update and implement this DMP?	<b>Xiaoyu Tan</b>