Plan Overview

A Data Management Plan created using DMPonline.be

Title: COPAM: High performance compact heat exchangers in pure copper by combining gyroid lattice structure design with laser based additive manufacturing and novel post-processing routes.

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Funder: KU Leuven (KUL)

Template: KU Leuven BOF-IOF

Project abstract:

Copper is the most conductive metal available besides silver. Hence it is ideally suited for heat extraction and thermal cooling applications, especially when complex optimized geometrical shapes with high surface to volume ratios can be produced by for instance the use of Additive Manufacturing (AM). This ambitious research project aims at reducing the mass and increasing the specific thermal performance of pure copper heat exchangers significantly. This will be achieved by researching novel gyroid lattice structure designs, beyond state-of-the-art laser based additive manufacturing processes, unique post-processing strategies and in-depth understanding of the mechanical and thermal behaviour of the structures. The intended outcome is a validated proof-of-concept of a multi-functional compact and lightweight copper heat exchanger, combining high specific structural and thermal performance in one integrated component. This project will serve as a catalyst for the collaboration between KU Leuven and UC Louvain on Additive Manufacturing while the resulting demonstrator will be used to attract industrial attentions and to define follow-up projects at higher TRL with industrial stakeholders in Belgium and beyond.

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COPAM: High performance compact heat exchangers in pure copper by combining gyroid lattice structure design with laser based additive manufacturing and novel post-processing routes.

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.

Dataset name / ID	Description	New or reuse	Digital or Physical data	Data Type	File format	Data volume	Physical volume
		Indicate: N(ew data) or E(xisting data)	Indicate: D(igital) or P(hysical)	Indicate: Audiovisual Images Sound Numerical Textual Model SOftware Other (specify)		Indicate: <1GB <100GB <1TB <5TB >5TB NA	
Copper test samples	samples in different material combinations produced at MTM and WTK	N	P	samples	NA	NA	10-100 samples (<0.5m³)
LPBF demonstrators		N	P	demonstrators	NA	NA	10-15 parts (<0.5m³)
Properties of copper parts	describing mass, density, microstructure, ...	N	D	N	.csv, .txt. docx, .m	<1Gb	
Mechanical fatigue data of multimaterial parts	results from stress-based fatigue tests	N	D	N	.instron	10-20Gb	
Images and videos	from the process and the samples	N	D	A, I	.png, .mp4	10-15Gb	
Metadata describing the setup and procedures		N	D	T	.txt, .docx, .pptx, .pdf	<3Gb	

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.

- No

NA

Will you process personal data? 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).

- No

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

The manufacturing methods that will be developed for multimaterial processing and that will be described in the MetaData mentioned above will be considered as confidential and could lead to patent filings.

Do existing 3rd party agreements restrict exploitation or dissemination of the data you (re)use (e.g. Material or Data transfer agreements, Research collaboration agreements)? If so, please explain in the comment section to what data they relate and what restrictions are in place.

- No

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 in the comment section to what data they relate and which restrictions will be asserted.

- No

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).

multimaterial test samples: will be named and labelled and stored in dedicated sample boxes that the AM teams have been using regularly. Samples boxes will be stored in a closet dedicated to this project.
multimaterial demonstrators: will be labelled and foreseen by a short text
Properties of multimaterial parts; Mechanical fatigue data of multimaterial parts; Images and videos and Metadata describing the setup and procedures will be stored in separate folders with "readme.txt" explanation of folder structure, on the OneDrive folder that the consortium has made specifically for this project to collaborate. After the project end date, this data will be transferred to the KU Leuven K: drive (archive) with automatic backup.

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.

- No

Data Storage & Back-up during the Research Project

Where will the data be stored?

- OneDrive (KU Leuven)
- Other (specify below)

other = KU Leuven K drive after the end of the project (archive)

How will the data be backed up?

- Standard back-up provided by KU Leuven ICTS for my storage solution
- Personal back-ups I make (specify below)

Personal back-ups = AM team offline backup NAS (once every 2 months)

Is there currently sufficient storage & backup capacity during the project?

If no or insufficient storage or backup capacities are available, explain how this will be taken care of.

- Yes

How will you ensure that the data are securely stored and not accessed or modified by unauthorized persons?

On the one hand, in this project no sensitive personal data will be used. On the other hand, both cloud and ICTS based storage solutions are only accessible via proper credentials which are centrally managed. Hence, unauthorized access via legal means is not possible

What are the expected costs for data storage and backup during the research project? How will these costs be covered?

None

Data Preservation after the end of the Research Project

Which data will be retained for 10 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...).

- All data will be preserved for 10 years according to KU Leuven RDM policy

Where will these data be archived (stored and curated for the long-term)?

- Other (specify below)

KU Leuven K; drive

What are the expected costs for data preservation during the expected retention period? How will these costs be covered?

None

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.

- Yes, as restricted data (upon approval, or institutional access only)

Multimaterial manufacturing is novel and hence data will be made available but only after approval of the consortium.

If access is restricted, please specify who will be able to access the data and under what conditions.

All data will be shared openly within KU Leuven using the onedrive folder. External parties (e.g. companies) can only access the data after approval by the consortium and e.g. after setting up an NDA if required.

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, intellectual property rights

Any of the mentioned datatypes could disclose confidential information on the KU Leuven research, for instance methods that could be patented, and hence this will be checked with the KU Leuven consortium before making datasets publicly available. In reality, it is expected that only a small amount of data will be considered confidential and not-publicly accessible.

Where will the data be made available?

If already known, please provide a repository per dataset or data type.

- KU Leuven RDR (Research Data Repository)

When will the data be made available?

- Upon publication of research results

Which data usage licenses are you going to provide?

If none, please explain why.

- CC-BY 4.0 (data)

Do you intend to add a persistent identifier (PID) to your dataset(s), e.g. a DOI or accession number? If already available, please

provide it here.

- Yes, a PID will be added upon deposit in a data repository

What are the expected costs for data sharing? How will these costs be covered?

Possible costs linked to open repositories and costs related to preparing data and uploading it will be covered by the project budget

Responsibilities

Who will manage data documentation and metadata during the research project?

The main PI, Brecht Van Hooreweder

Who will manage data storage and backup during the research project?

All researchers involved.

Who will manage data preservation and sharing?

The main PI, Brecht Van Hooreweder

Who will update and implement this DMP?

The main PI, Brecht Van Hooreweder