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## NEAR-NET SHAPE MANUFACTURING OF INNOVATIVE MULTI-MATERIALS

*A Data Management Plan created using DMPonline.be*

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**Template:** KU Leuven BOF-IOF

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**Project abstract:**

Near-net shape fabrication has always been a major challenge for the powder metallurgy industry, especially when geometrically-complex parts are targeted, and difficult-to-densify materials or material combinations are envisaged. Extensive and costly hard-machining or green machining, before a final sintering step, requiring a green body with sufficiently high green strength, are required. The current proposal aims at reducing or even eliminating post machining operations and integrating multiple functionalities within a single, geometrically-complex part by the development of multimaterials and/or functionally graded materials, exhibiting a gradient in microstructure, composition or a combination thereof. The targeted multi-material components and associated manufacturing strategies are expected to demonstrate clear added value, lower production cost and improved performance compared to their monolithic counterparts.

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## NEAR-NET SHAPE MANUFACTURING OF INNOVATIVE MULTI-MATERIALS

### 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
		<i>Indicate: N(ew data) or E(xisting data)</i>	Indicate: D(igital) or P(hysical)	Indicate: Audiovisual Images Sound Numerical Textual Model SOftware Other (specify)		Indicate: <1GB <100GB <1TB <5TB >5TB NA	
PhD1_1	Geometric Input Files for Selective Powder Deposition	N	D	I / SO	JPG, STL	<1TB	
PhD1_2	Raw Sintering Data for Multimaterials	N	D	N	TXT	<1GB	
PhD1_3	SEM images	N	D	I	JPG, TIF	<1TB	
PhD1_4	FE input files	N	D	SO	INP,CAE,MPHBIN	<1TB	
PhD1_5	Raw data mechanical testing	N	D	N	TXT	<1GB	
PhD2_1	Geometric Input Files for Direct Ink Writing	N	D	SO	STL	<1TB	
PhD2_2	SEM and EPMA images	N	D	I / N	JPG, TIF	<1 TB	
PhD2_3	Dilatometry Data	N	D	N	TXT	<1GB	
PhD2_4	Hardness and toughness data	N	D	N	TXT	<1GB	
PhD2_5	Hybrid Machining Data	N	D	N	TXT	<1GB	
PhD3_1	Geometric Input Files for Selective Powder Deposition	N	D	I / SO	JPG, STL	<1TB	
PhD3_2	X-ray Tomography Data	N	D	SO	DICOM	<5TB	
PhD3_3	TODWA movies / images	N	D	A / I	MP4, AVI, JPG	<5TB	
PhD3_4	FE Simulation Files	N	D	SO	MPHBIN	<1TB	
PhD3_5	SEM and EPMA data	N		I / N	JPG, TIF	<1TB	

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

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

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).

All sample data related to each PhD will receive a unique labelling system, starting with PhDx (x=1-3), and providing information on date of fabrication and sample composition. All sample labels will be shared in a shared Microsoft Excel sheet, with all related experimental results connected, explaining the type of measurement performed.

Similarly, numerical simulation input file will receive a unique label and a Microsoft Word Sheet will be shared, displaying all necessary information required to interpret the simulation files.

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?

- Large Volume Storage
- Sharepoint online

- OneDrive (KU Leuven)
- Personal network drive (I-drive)

Experimental data will be shared in a OneDrive Folder - [https://kuleuven-my.sharepoint.com/personal/kim\\_vanmeensel\\_kuleuven\\_be/\\_layouts/15/onedrive.aspx?id=%2Fpersonal%2Fkim%5Fvanmeensel%5Fkuleuven%5Fbe%2FDocuments%2FC2%20Proposal%20%2D%20Multimaterials&view=0](https://kuleuven-my.sharepoint.com/personal/kim_vanmeensel_kuleuven_be/_layouts/15/onedrive.aspx?id=%2Fpersonal%2Fkim%5Fvanmeensel%5Fkuleuven%5Fbe%2FDocuments%2FC2%20Proposal%20%2D%20Multimaterials&view=0)

Each PhD student will use his/her personal OneDrive as well as personal network drive (I drive) to store personal data. In order to prepare project meetings (organized every 3 months with all people in the consortium), a Teams team will be created. Preparatory documents in this Teams team will be linked to a Sharepoint online platform.

Large Volume storage capacity will be used to store X-ray tomography images.

#### **How will the data be backed up?**

- Standard back-up provided by KU Leuven ICTS for my storage solution

#### **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.**

- No (explain solution below)

Large Volume storage capacity will be used to store X-ray tomography images.

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

Access to people who can view / edit the data is governed on an individual base. PhD researchers can only view and edit research data related to their specific research topic.

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

estimated cost for data storage ~ 5 keuro - Consumable costs to cover this amount of budget are foreseen in the C2 project proposal.

#### **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)?**

- Large Volume Storage (longterm for large volumes)
- KU Leuven RDR

On a long term:

The OneDrive folder will remain in place. Larger data sets can be transported to the KU Leuven RDR system. CT data will be stored on Large

Volume Storage Systems.

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

No extra costs will be involved.

#### **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)

Moreover, certain data, e.g. measurements of wetting and wetting kinetics, scripts describing the mechanical behaviour of a powder compact as a constitutive equation of a continuum, machining performance of graded cutting tools can be published, either as a data set, together with peer-reviewed publications or after contacting the authors of the publication (restricted data, upon approval).

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

The data can be accessed by the (co)promotors and PhD researchers of the current project (Prof. Lauwers, Prof. Seveno, dr. Huang, Prof. Vanmeensel) at all times. In case data from other PhDs are requested, either by one of the other involved PhD students or one of the project (co)supervisors who is not involved as (co)supervisor in that specific PhD topic, all involved people will inform each other prior to data use.

**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

Every PhD student will contact the corresponding supervisor of the PhD thesis prior to dissemination of project results into the public domain. The PhD supervisor will give permission for dissemination (or not), depending on the valorization viability of the obtained project results. In case the project result has high valorization potential, IP protection by patent filing will be performed.

**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.

- MIT licence (code)

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?**

So far the costs are unknown. The estimated amount of data that will be stored in repositories will be max 10 TB. The current cost to deposit data at Large Volume Storage accounts for € 104,42 / TB / year. During the project, these costs will be covered by the project budget. The (co)supervisors will discuss which and how many data will be stored on a longer term. Additionally, it will be discussed who and how the concomitant costs will be covered.

#### **Responsibilities**

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

Each PD researcher is responsible for the management of the research data collected within the framework of his/her own PhD.

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

Each PD researcher is responsible for data storage and data backup of data collected within the framework of his/her own PhD.

**Who will manage data preservation and sharing?**

After completion of the project, Prof. Vanmeensel will be responsible for managing the research data, their preservation and sharing.

**Who will update and implement this DMP?**

Prof. Vanmeensel will update this DMP and will be provided with relevant updates and input data by the PhD researchers.