DMP HUMIPLAST

'The development of melt electrowritten, flexible and micro-porous sensors for monitoring plant transpiration in real time'

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Template KU Leuven: BOF-IOF

Grant number / URL ID: IDN/23/007

Start date: 01/10/2023

End date: 30/09/2027

Project abstract

Climate change is posing serious threats on global agricultural productivity. More frequently than ever, crops are facing extreme and unpredictable weather events, which lead to drought, heat, flooding, and pathogen stress. Knowing how plants deal with stress and understanding how they are sensing stress is crucial for safeguarding agricultural productivity under a changing climate. The era of smart farming is revolutionizing our current farming systems, thanks to major advancements in electronics, information technology and material sciences.

In the HumiPlast project, we aim at developing an affordable humidity sensor able to measure plant transpiration in real-time, hereby combining advanced technologies in an interdisciplinary approach and progressing beyond the state-of-the-art. Melt electrowriting of novel polymers will be used as the high-resolution 3D printing tool to fabricate flexible meshes on which conductive and dielectric films will be placed to sense humidity by resistance or capacitance changes.

The development of such a novel plant sensor that can measure specific plant physiological processes, will open a new field in plant diagnostics.

Research Data Summary

Dataset name/ ID	Description	New (N) or Reuse (R)	Digital or physical data	Data type	File format	Data volume	Physical volume
SEM	Sample morphology/ characterization	N	digital	Experi-mental (Exp)	.tiff	<100MB	
MEW	Print parameters	N	Physical Digital	Exp	.xlsx, .csv, .txt	<100MB	Notes in lab book, print code in Motion Perfect
Electrical measurements	Probe station	N	Digital	Exp	txt,.csv	<1GB	
Mechanical measurements	Tensiometer	N	Digital	Exp	txt,.csv	<1GB	
XPS	surface chemistry analysis	N	Digital	Exp Software	.vms,.emf,.csv	<100MB	
AFM	roughness estimation	N	Digital	Exp	.jpg	<100MB	
PVD depositions	Sputtering/ patterning of thin films	N	Digital & physical	Exp Software	.xlsx	<100MB	Parameters written down on physical/ electronic logbook
^{1}H-NMR	Characterization of synthesis steps	N	Digital	Exp	.fid	<100MB	
GPC	Characterization of synthesis steps	N	Digital	Exp	.xlsx	<100MB	
Microscopic images	Characterization	N	Digital	Exp	.tiff, .jpeg, .eps	<250MB	
Plant material	Study objects	N	Physical (seeds)	Exp	/	/	Several falcon tubes.

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 (eg tech transfer for example spin offs commercial exploitation)? If so please comment per dataset or data type where appropriate

Yes

This work has a clear commercial potential. Both the raw and analyzed data that has the potential for commercial valorization, will be kept confidential and shared when appropriate only with the members of the research group. Possible IP will be explored and on a case by case basis we will evaluate whether to patent (LRD office) or publish an article on our work.

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

All protocols and methodology are kept in Excel spreadsheets and word doc. and shared among team members. The files are kept on a personal computer and on a cloud service (Onedrive, shared folder). Accompanying readme files explaining the electronic filing system will always be kept in the main directory. Data collected directly from certain equipment with no possible digital data format(s) are kept in a physical and/or electronic laboratory notebook (Evernote).

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 metadata standard will be used here.

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 are saved.

Data Storage & Back up during the Research Project

Where will the data be stored?

OneDrive (KU Leuven)

Shared network drive (J drive)   Personal network drive (I drive)

How will the data be backed up?

Standard back up provided by KU Leuven ICTS.   Personal backups made as described below:

Additional backups will be archived in the protected ESAT cloud Long term data preservation (after research) and every 6 months all data is backed up in to a physical open drive

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?

Data on one-drive is encrypted and requires authentication to access it. Every team member has a unique link that allows access from his/her account. Data on the personal workstation is protected by an access password. The data on the pendrive is zipped in a password protected archive.

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

Every KU Leuven employee has 1TB of storage free to use, physical external hard disks of 4TB cost +- 150 euro. This can be covered by the project budget.

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 at least 10 years according to KU Leuven RDM policy. Special attention will be given to IP-sensitive data.

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

 KU Leuven RDR

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

We expect the costs for data preservation during the expected retention period to be manageable (< 3000 euro). The costs for data preservation during the project will be covered by the project and after the project shared by the involved PI's.

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 open data

- Published work
- SOPs (when not part of an IP-application)

Yes, as restricted data (upon approval) or institutional access only: some data could remain confidential due to the potential for commercialization

- Data sets with IP-potential
- SOPs with IP-potential

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

Team members and LRD will be able to access the data (upon approval from the PI's)

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

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

To be discussed with LRD

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?

The expected costs for data sharing are expected to be rather low (<2000 euro) and are covered by the project.

Responsibilities

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

The team members

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

The team members

Who will manage data preservation and sharing?

The PI's

Who will update and implement this DMP?

 Prof. Bloemen