1. Opis danych oraz pozyskiwanie lub ponowne wykorzystanie dostępnych danych

Sposób pozyskiwania i opracowywania nowych danych i/lub ponownego wykorzystania dostępnych danych

The project will involve the collection of two types of data: data obtained from laboratory measuring instruments and data generated by project personnel. Members of the research team will document measurement procedures, record preliminary data, and note key observations in individual laboratory notebooks. These records will be regularly shared with the team during project meetings. The most significant information will be digitized to ensure durability and ease of access.
The methodology for collecting data from measurement devices will be standardized and implemented in accordance with measurement protocols developed by the project manager. Selected measurement procedures will be repeated to ensure the consistency and reliability of results. All data acquired from measurement instruments will be stored on two independent data drives to ensure data security and protection.

Pozyskiwane lub opracowywane dane (np. rodzaj, format, ilość)

The estimated total volume of acquired and analyzed data is about 30 GB during the whole project.
The following categories of data will be produced during the project duration:
- Physical samples of ZnO based varistors, which will be stored in plastic boxes with labels
- Information about synthesis process and measurement procedure gathered in Excel (.xlsx)
- X-ray diffraction fluorescence - Excel .xlsx (tables)
- X-ray diffraction data format – brml/raw (raw data), dat/uxd/udf (exported data)
- Impedance spectroscopy data - .dat files
- Optical and electron micrographs and other images – .tiff, .jpg
- Finite Element Method - Ansys file - .msh, .rst
- Results of data analysis stored in .opj (graphs) and .xlsx (tables) files
- Laboratory notes stored in the laboratory notebooks – hardcopy (for each team member) - The most important laboratory notes, describing the whole process, will be stored in digital version - .doc, .docx or .pdf files

2. Dokumentacja i jakość danych

Metadane i dokumenty (np. metodologia lub pozyskiwanie danych oraz sposób porządkowania danych) towarzyszące danym

To ensure clarity, consistency, and traceability throughout the project, file and directory naming conventions will be strictly unified:

- Sample names will adhere to the following standardized format: sample_number_composition_temperature_duration_date, e.g., S001_ZnO_1000C_2h_010125.dat.

- Measurement data will be organized using a hierarchical directory structure as follows: MAIN DIRECTORY / OPERATOR INITIALS / PROJECT NAME / SAMPLE SET / SAMPLE NAME / DATA TYPE, e.g., DATA/LL/PRELUDIUM24/ALTERNATIVE SYNTHESIS METHODS/ZNO VARISTORS/XRD/S001_ZnO_1000C_2h_010125.brml.

Each dataset associated with varistor fabrication processes will include an accompanying README file. This file will contain a summary of the measurement methodology, a guide to interpreting the naming conventions, and identification of each measurement iteration.

The above naming convention will be consistently applied across both active data storage and offline backup copies stored on individual hard drives, ensuring secure and organized data management.

Metadata for datasets selected for deposition in the repositories of Gdańsk Tech specifically, the Bridge of Data (MOST Wiedzy Open Research Data Catalog) — will be standardized using a metadata protocol adopted at Gdańsk Tech. This protocol employs open file formats, such as JSON, to facilitate interoperability and long-term accessibility.

Stosowane środki kontroli jakości danych

All measuring devices used in the project will record data in a standardized format, with each dataset accompanied by a README file documenting the measurement procedure.

An initial selection of data will focus on eliminating gross errors and confirming repeatability. Project Manager Kuba Wójcik will individually review the data to identify and minimize systematic and operator-related errors. Each dataset will include uncertainty values as specified by the device manuals. All measuring instruments will be calibrated and standardized prior to use.

Collected data will be organized in accordance with FAIR principles (Findable, Accessible, Interoperable, Reusable). Data intended for open access will be deposited in certified repositories, assigned a DOI, and indexed to ensure long-term availability and accessibility.

3. Przechowywanie i tworzenie kopii zapasowych podczas badań

Przechowywanie i tworzenie kopii zapasowych danych i metadanych podczas badań

All data collected during the project will be stored locally on computers, with two copies maintained on separate devices to ensure redundancy. To prevent data loss due to hardware failures, backups will be created regularly—at least once a week during active

measurement phases—and stored in an external web-based repository automatically managed by a dedicated server. Additionally, all measurement data will be saved directly on the respective measuring devices.

Data transfer will be conducted using secure internal mail servers of Gdańsk Tech in coordination with OneDrive (Office 365 for faculty). The project team will work closely with IT support to maintain high standards of data storage security and reliability.

Sposób zapewnienia bezpieczeństwa danych oraz ochrony danych wrażliwych podczas badań

Access to project data and backups will be restricted to authorized team members only. Electronic data will be password-protected, with passwords updated regularly. Physical research notebooks will be stored in locked cabinets to prevent unauthorized access.

In the event of a failure, the technical support teams at Gdańsk Tech will assist in data recovery.

The project does not involve any sensitive data, including personal information or politically sensitive content.

4. Wymogi prawne, kodeks postępowania

Sposób zapewnienia zgodności z przepisami dotyczącymi danych osobowych i bezpieczeństwa danych w przypadku przetwarzania danych osobowych

Nie dotyczy

Sposób zarządzania innymi kwestiami prawnymi, np. prawami własności intelektualnej lub własnością. Obowiązujące przepisy

Ownership and management of all intellectual property arising from the Project shall remain with Gdańsk Tech and the research team members, in accordance with Polish law and institutional regulations (Resolution of the Senate of Gdańsk Tech No. 117/2021/XXV dated 19 May 2021, available at: https://link.pg.edu.pl/GdańskTech_intprop).

5. Udostępnianie i długotrwałe przechowywanie danych

Sposób i termin udostępnienia danych. Ewentualne ograniczenia w udostępnianiu danych lub przyczyny embarga

A portion of the project data will be published in the open research data repository — MOST Wiedzy Open Research Data Catalog. Data uploads will be conducted systematically in alignment with the publication schedule of related scientific articles. Some data may also be published alongside scientific journal articles, which may

require the publication of raw data.

All data generated during the project may be shared upon formal request directed to Project Manager Kuba Wójcik, but only after project completion. Scientific publications will include contact information for the Project Manager and details about accessing data through the Bridge of Data (MOST Wiedzy) repository.

In accordance with project requirements and with the consent of Gdańsk Tech authorities, data and results will be published under an open-access model, either CC0 or CC BY licenses. Metadata will always be made freely available without restrictions under the CC0 license.

Sposób wyboru danych przeznaczonych do przechowania oraz miejsce długotrwałego przechowywania danych (np. repozytorium lub archiwum danych)

Preprocessed data deposited in the repository will be carefully selected based on scientific value and exemplary quality. All data collected throughout the project will be retained by the Project Manager for a minimum of 10 years and may be made available upon request.

The primary data repository will be Bridge of Data (MOST Wiedzy), which holds the CoreTrustSeal certification, ensuring long-term data retention, security, and reliability. Additionally, the repository provides users with easy and intuitive access to the data.

Metody lub narzędzia programowe umożliwiające dostęp do danych i korzystanie z danych

Data stored in the repositories will be provided in TXT or CSV formats, depending on the nature of the data. Raw, unprocessed data may be made available upon individual request.

Software used for data processing will be accessible either under open-source licenses or through internal paid licenses held by Gdańsk Tech.

Sposób zapewniający stosowanie unikalnego i trwałego identyfikatora (np. cyfrowego identyfikatora obiektu (DOI)) dla każdego zestawu danych

The datasets provided in the repository will have the DOI assigned (Digital Object Identifier).

6. Zadania związane z zarządzaniem danymi oraz zasoby

Osoba (np. funkcja, stanowisko i instytucja) odpowiedzialna za zarządzanie danymi (np. data steward)

Project Manager Kuba Wójcik will oversee procedural assessments and ensure overall data quality. The Open Science Competence Center at Gdańsk Tech (pg.edu.pl/openscience) will be responsible for the Data Management Plan (DMP), as well as data storage and dissemination.

Środki (np. finansowe i czasowe) przeznaczone do zarządzania danymi i zapewnienia możliwości odnalezienia, dostępu, interoperacyjności i ponownego wykorzystania danych

The project team, led by Project Manager Kuba Wójcik, will analyze the research data. During regular meetings with scientific supervisor, the team will evaluate the relevance and select the most appropriate data for further use.

Selected data will be uploaded to the MOST Wiedzy Open Research Data Catalogue. When necessary, accompanying README files will be created to describe the datasets, aiding interpretation and future use.

General data management guidelines, as well as those developed during regular meetings, will be overseen by the Project Manager and followed by scientific supervisor Marek Olesz.