NanoCommons

Nano-Knowledge Community

The European Nanotechnology Community Informatics Platform: Bridging data and disciplinary gaps for industry and regulators

This project has received funding from the European Union Horizon 2020 Programme (H2020) under grant agreement no. 731032

NanoCommons

Nano-Knowledge Community

Electronic Lab Notebooks
Demo of NanoCommons-powered Features

ELN Hackathon
13 January 2022

What are laboratory notebooks

NanoCommons
Nano-Knowledge Community

Definition

A laboratory notebook is the main means for recording research.

Scope

- Document hypotheses
- Design experiments and experimental procedures
- Record methods/protocols
- Record experimental settings
- Record observations / data
- Initial analysis / interpretation
- Protect intellectual property

Traditional laboratory notebooks

NanoCommons
Nano-Knowledge Community

The bottlenecks

- Paper…
- Slow recording, often post experiment, missed information
- Expensive, need huge storage space
- Cannot be backed up (realistically)
- Cannot be searched
- Difficult to decipher
- Lack of collaboration (in practice)
- Reproducibility

Traditional laboratory notebooks

NanoCommons
Nano-Knowledge Community

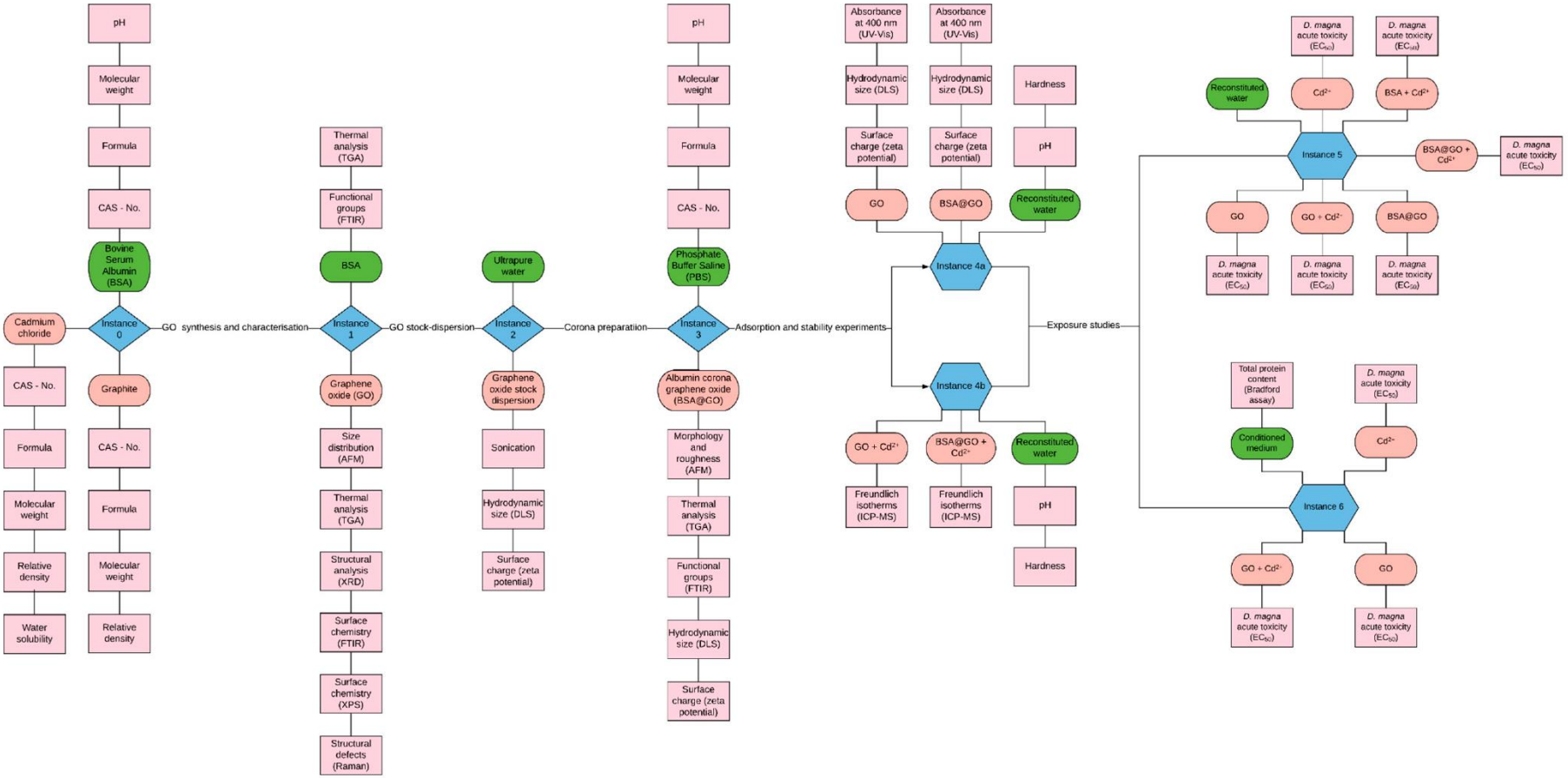
Case study – Research Laboratory

- Reproduce an experiment from 5 years ago:
  - Identify the correct lab book
  - Identify the correct experiment
  - Understand someone else's writing
  - Decode the writing method
  - Understand the process
  - Understand the settings
  - Retrieve the original raw data (where from?)
  - Do the experiment…

Traditional laboratory notebooks

NanoCommons
Nano-Knowledge Community

Case study – Research Laboratory



Source: Martinez et al. Nanomaterials 2020, 10(10), 1936

Electronic laboratory notebooks

NanoCommons
Nano-Knowledge Community

Requirements

- Team creation and sharing
- Local or cloud based (but definitely networked)
- Text input (notes, data, deviations…)
- Data import
- Import images and annotations
- Protocols repository
- Searchable
- Report creation
- APIs

Electronic laboratory notebooks

NanoCommons
Nano-Knowledge Community

The benefits

- Streamlined project management
- Local or cloud based
- Easy to setup complex experiments (compared to traditional lab books)
- Protocol method integration
- Notes / settings / deviation recording
- Quick data recording
- Direct data digitisation
- QA / QC
- Team-wide collaboration

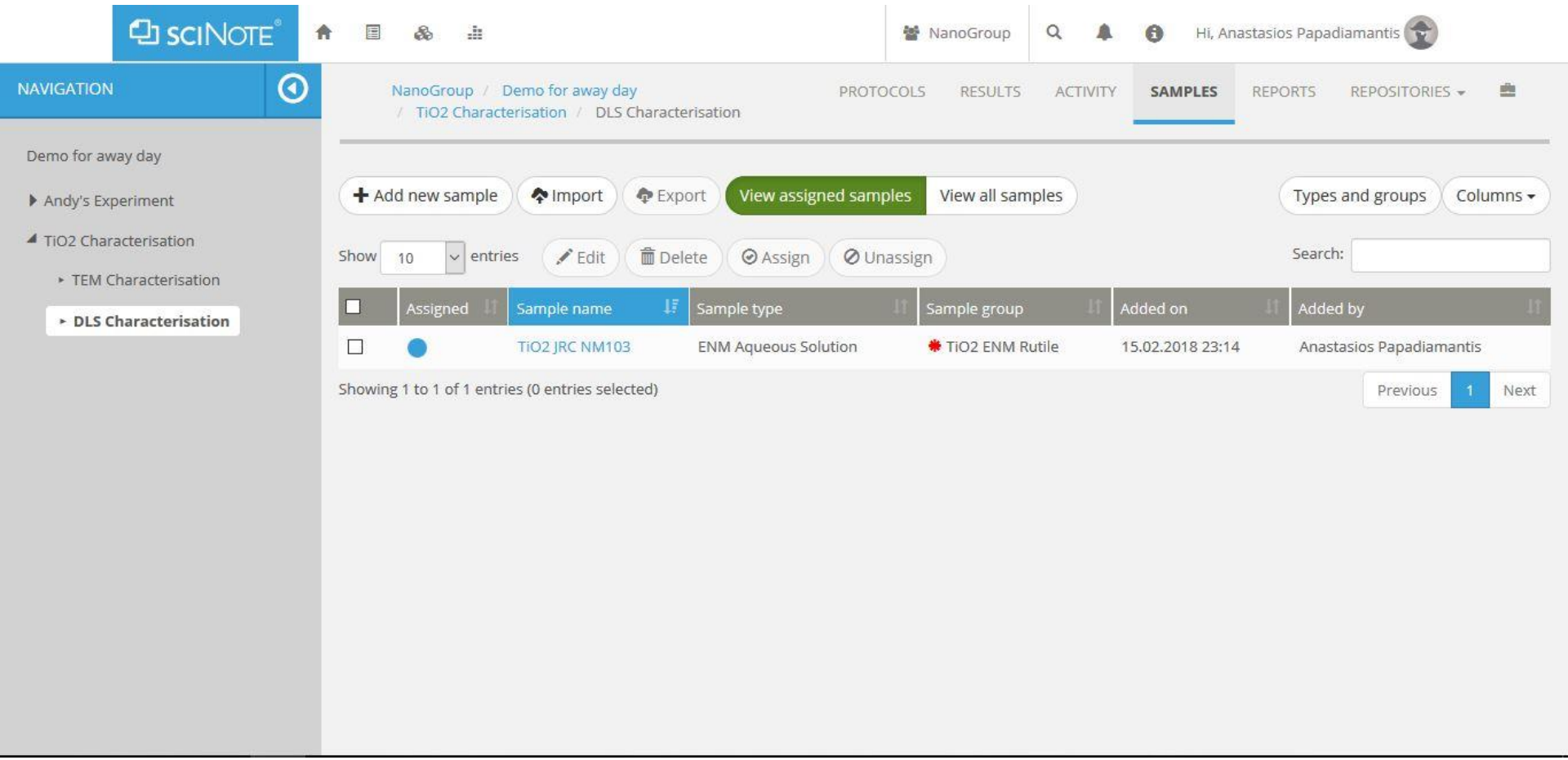
Electronic laboratory notebooks

NanoCommons
Nano-Knowledge Community

The barriers

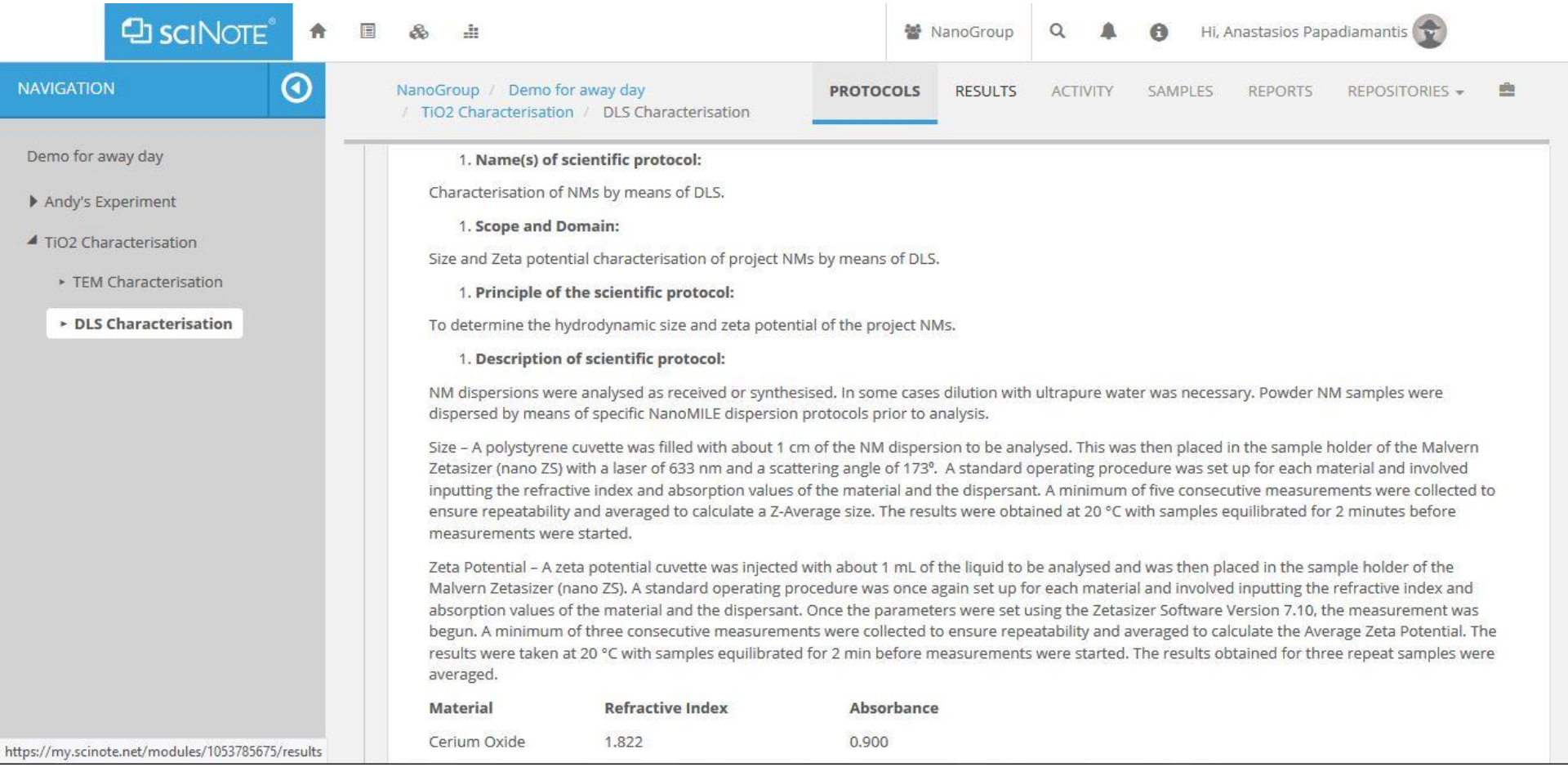
- Established habits
- Lack of time
- Lack of data management literacy
- Mistrust of cloud-based / digital tools
- Heavy transition burden
- Training requirements

Data Acquisition & Management



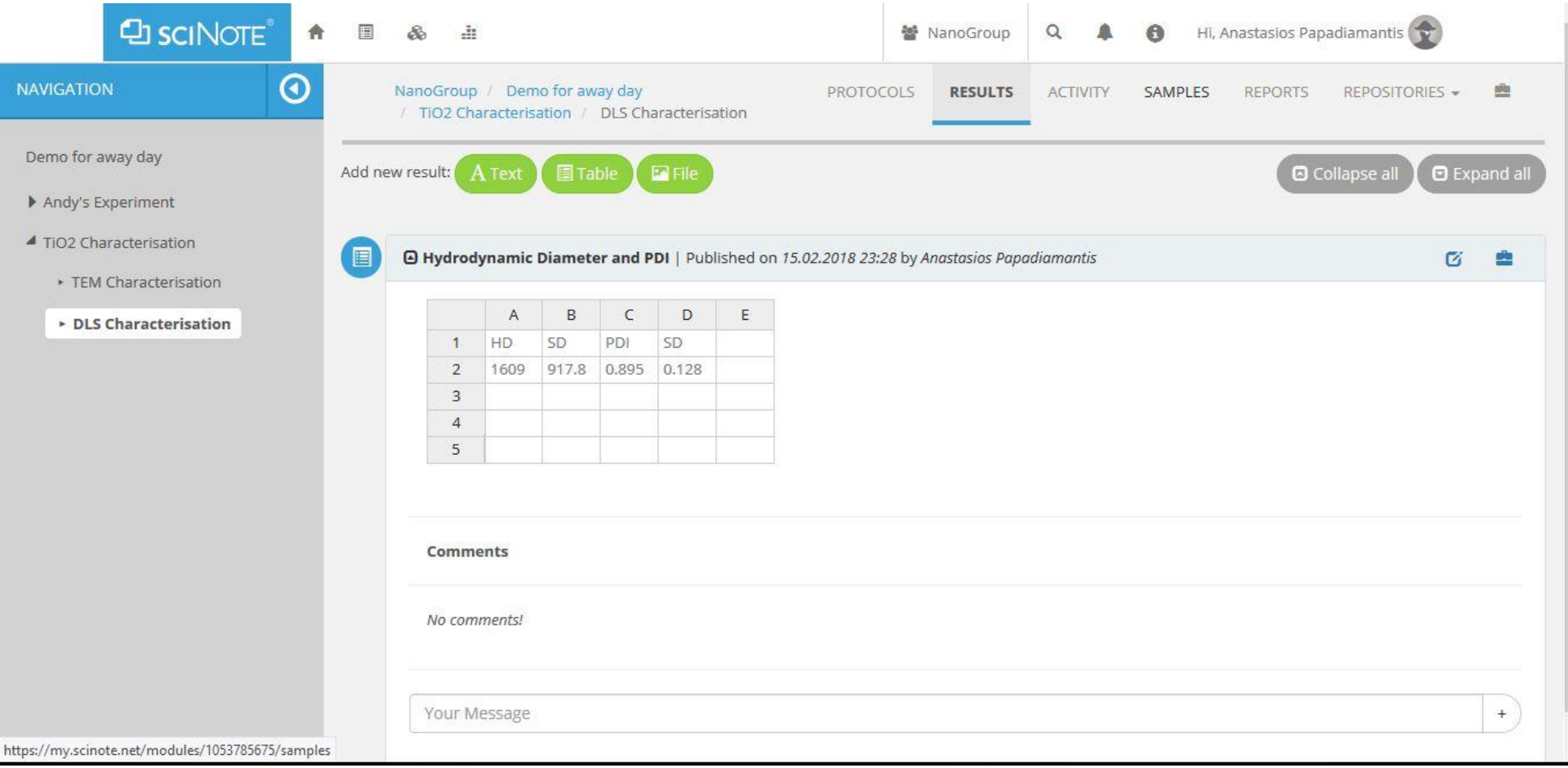
- **Sample insertion and assignment**

Data Acquisition & Management



- **Fully linked analytical protocols**

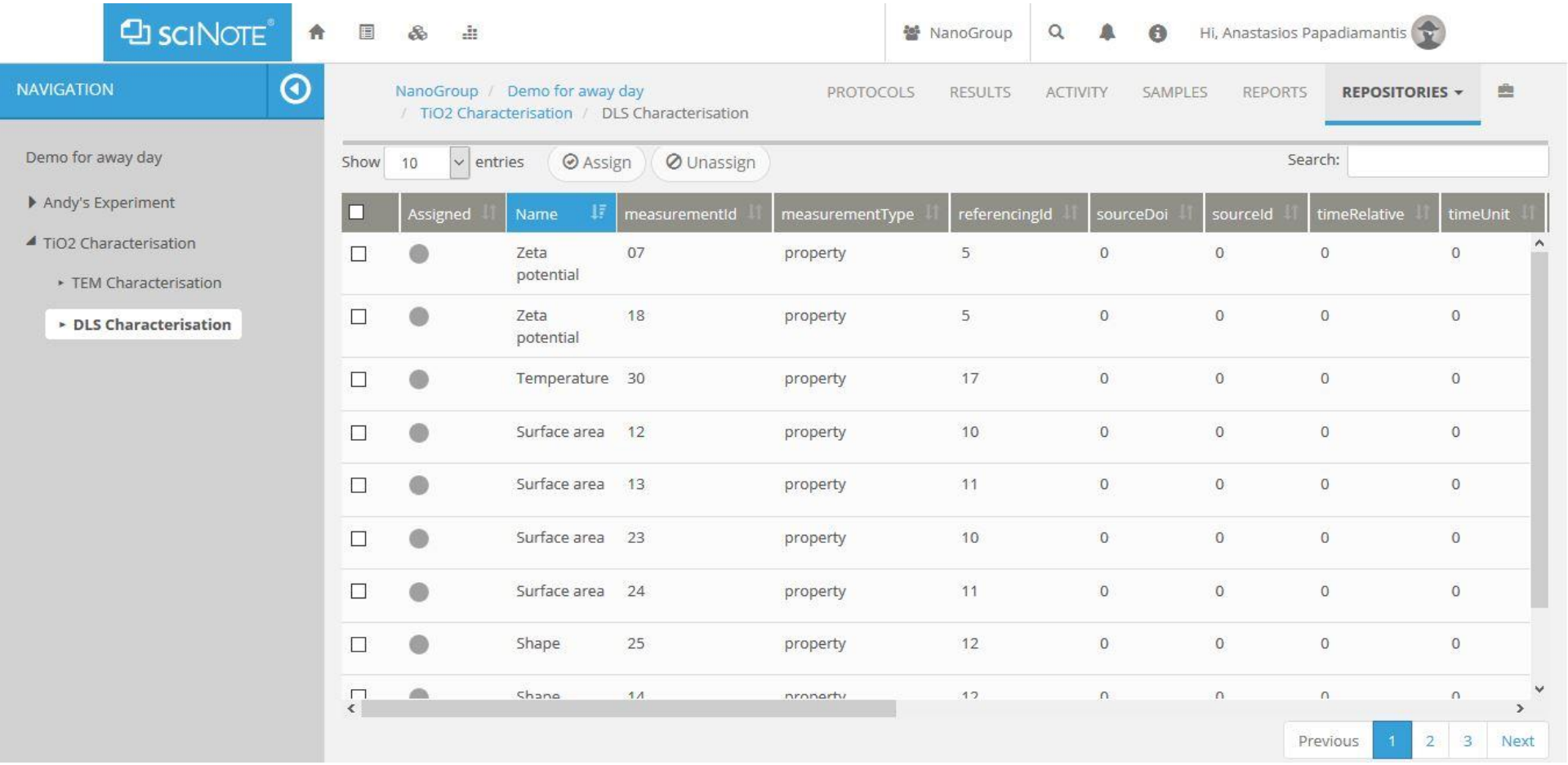
Data Acquisition & Management



	A	B	C	D	E
1	HD	SD	PDI	SD	
2	1609	917.8	0.895	0.128	
3					
4					
5					

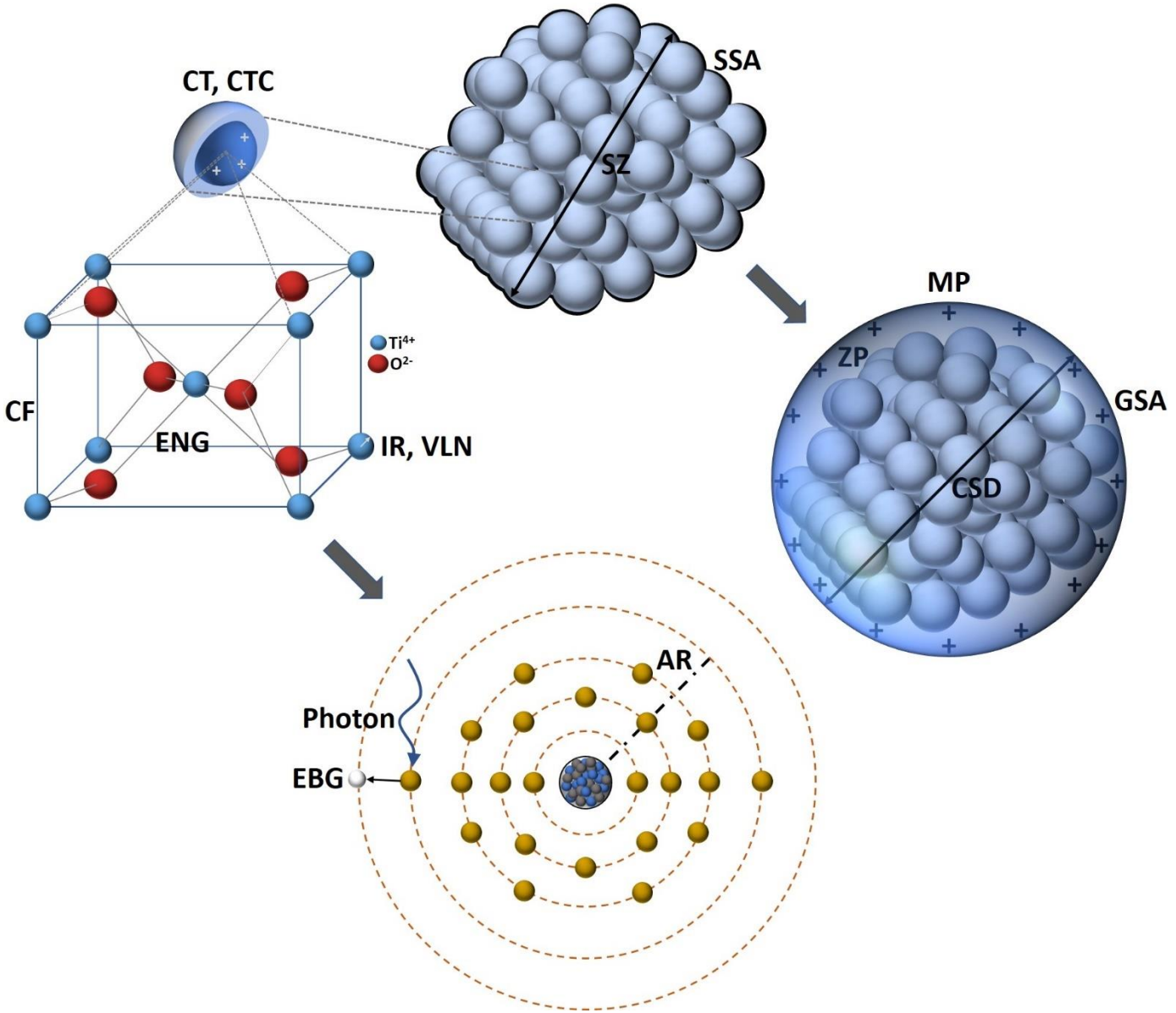
- **Specific experimental results**

Data Acquisition & Management



- **Automatic extraction and shipment to data repository via email**

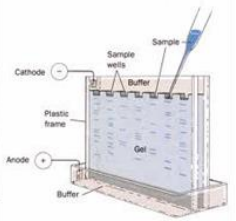
Case study
Nanomaterials Characterisation

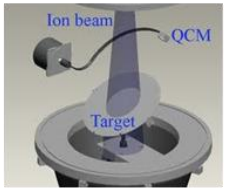


From a Local Network…

NanoCommons
Nano-Knowledge Community


DCS



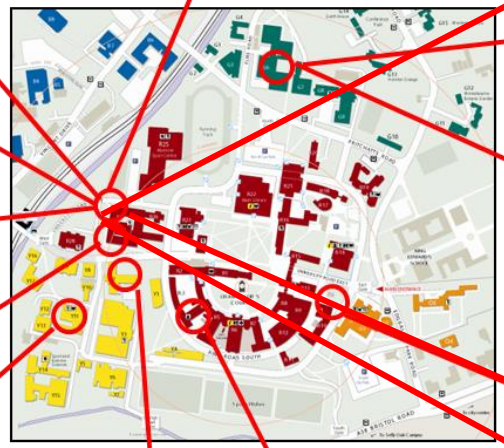


QCM


BET

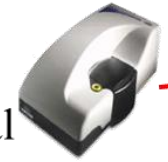
Eco-interactions
(Electrophoresis, gel imaging etc.)

FFF

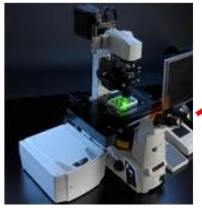



TEM
(+ EDS, EELS)

DLS
Zeta potential

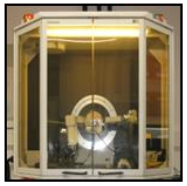



SEM,
ESEM


Confocal


AFM

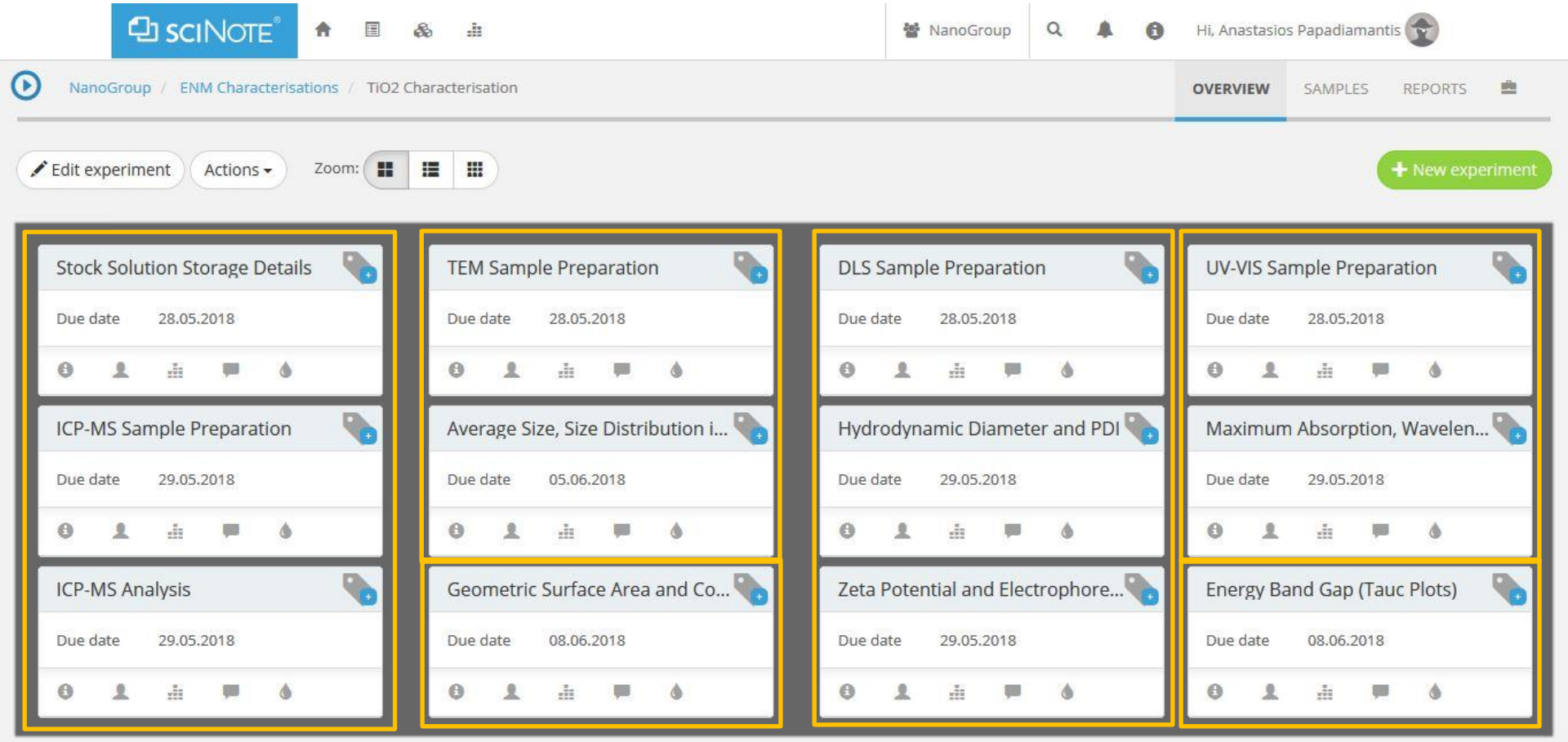

NTA


XRD


ICP-MS
Sp-ICP-MS
ICP-AES
Sc-ICP-MS


UV-VIS

Experimental Workflow



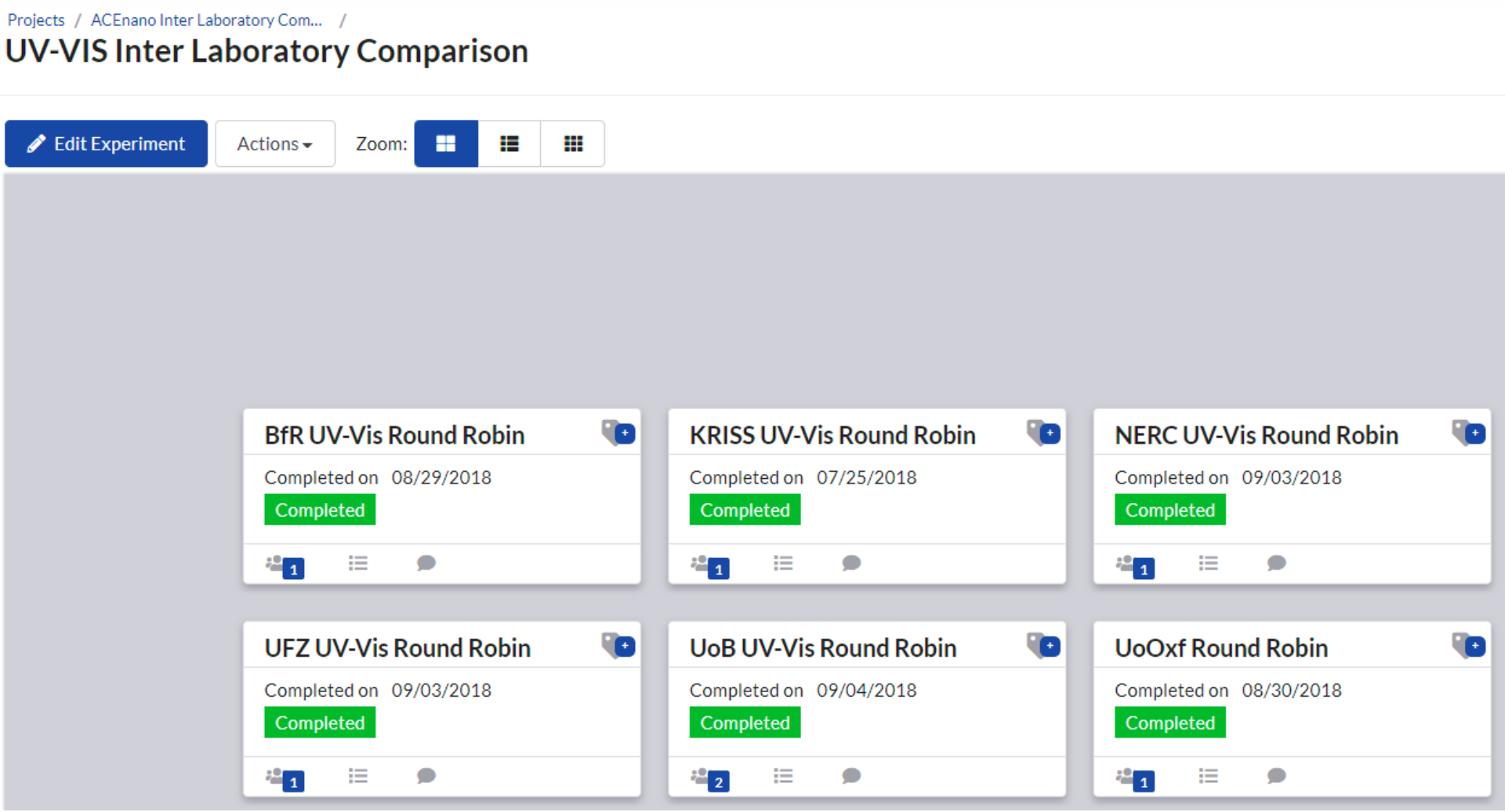
- **Multiple-branch experimental workflows**

To a Wide Network…

NanoCommons
Nano-Knowledge Community

To a Wide Network…

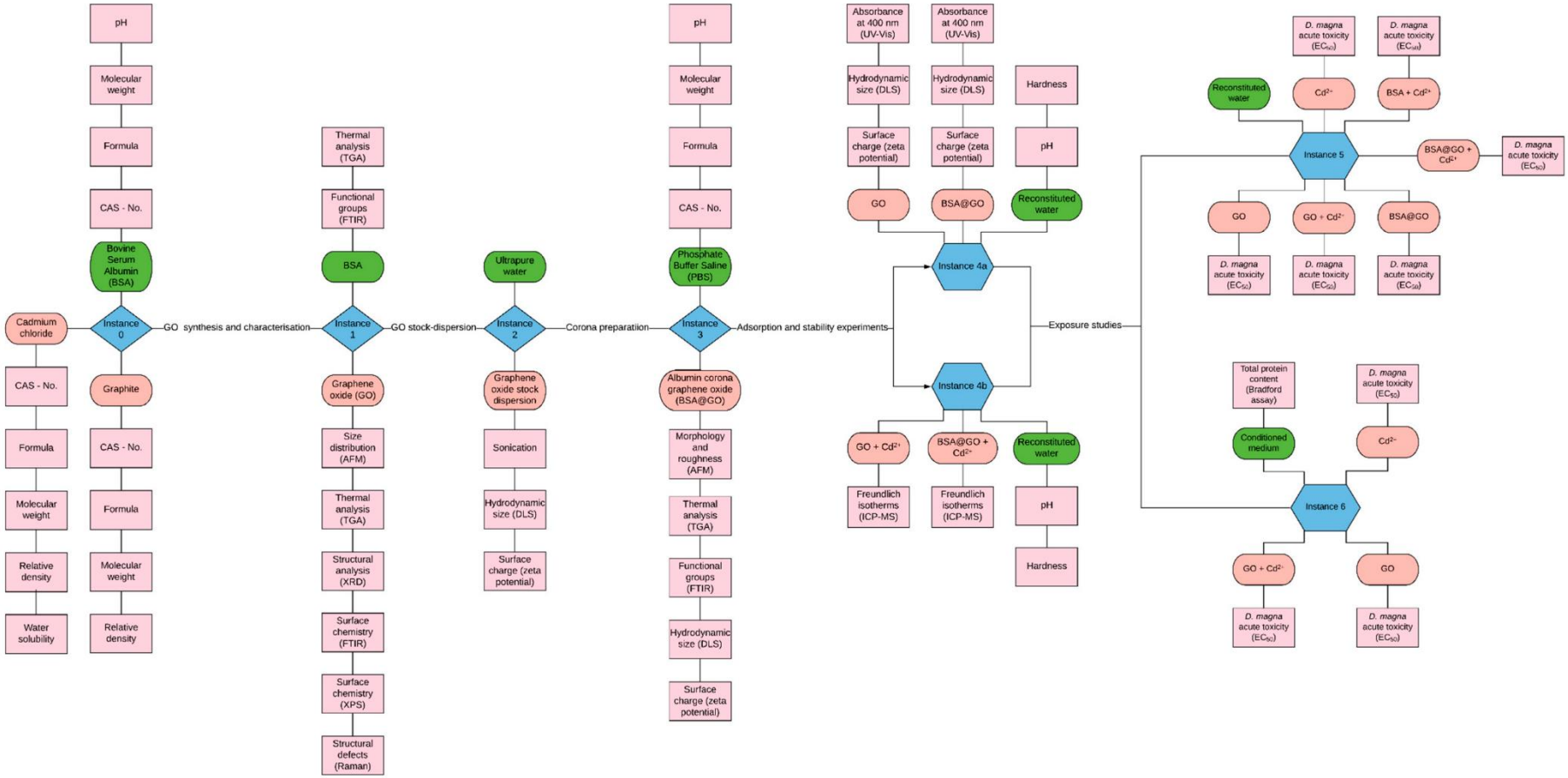
NanoCommons
Nano-Knowledge Community



Electronic laboratory notebooks

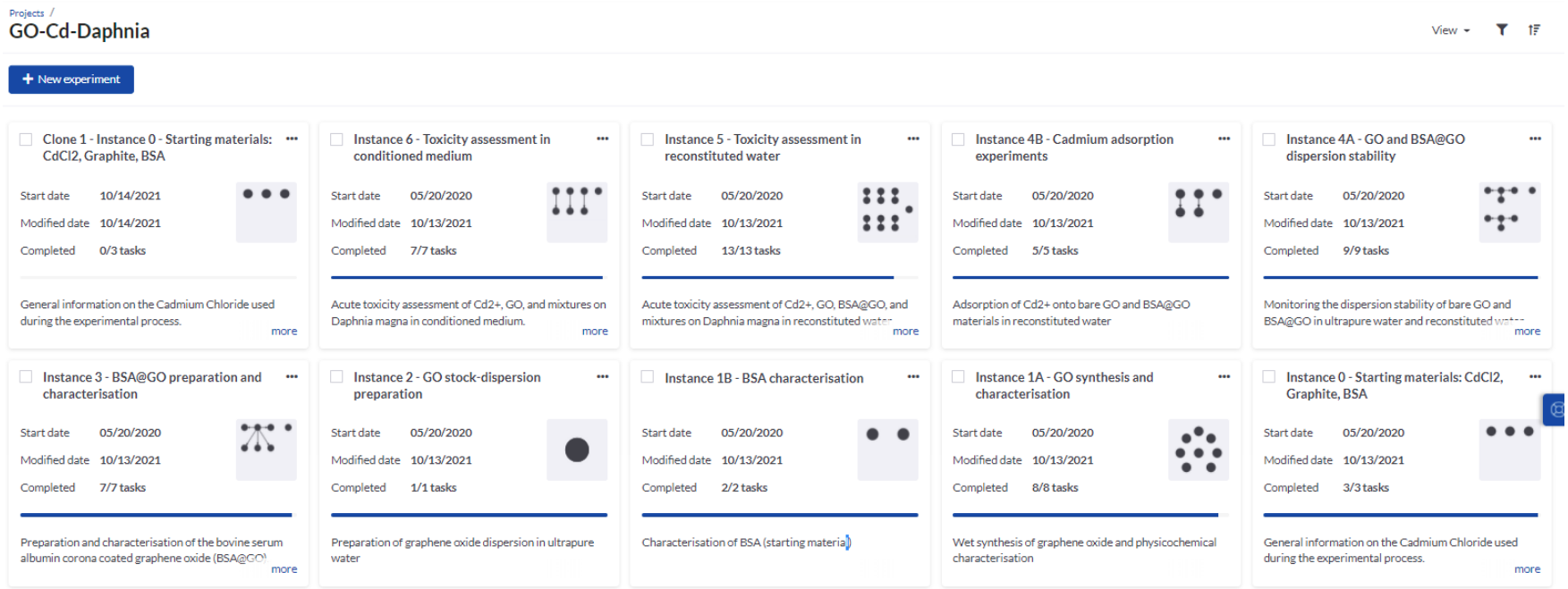
NanoCommons
Nano-Knowledge Community

Let's go back



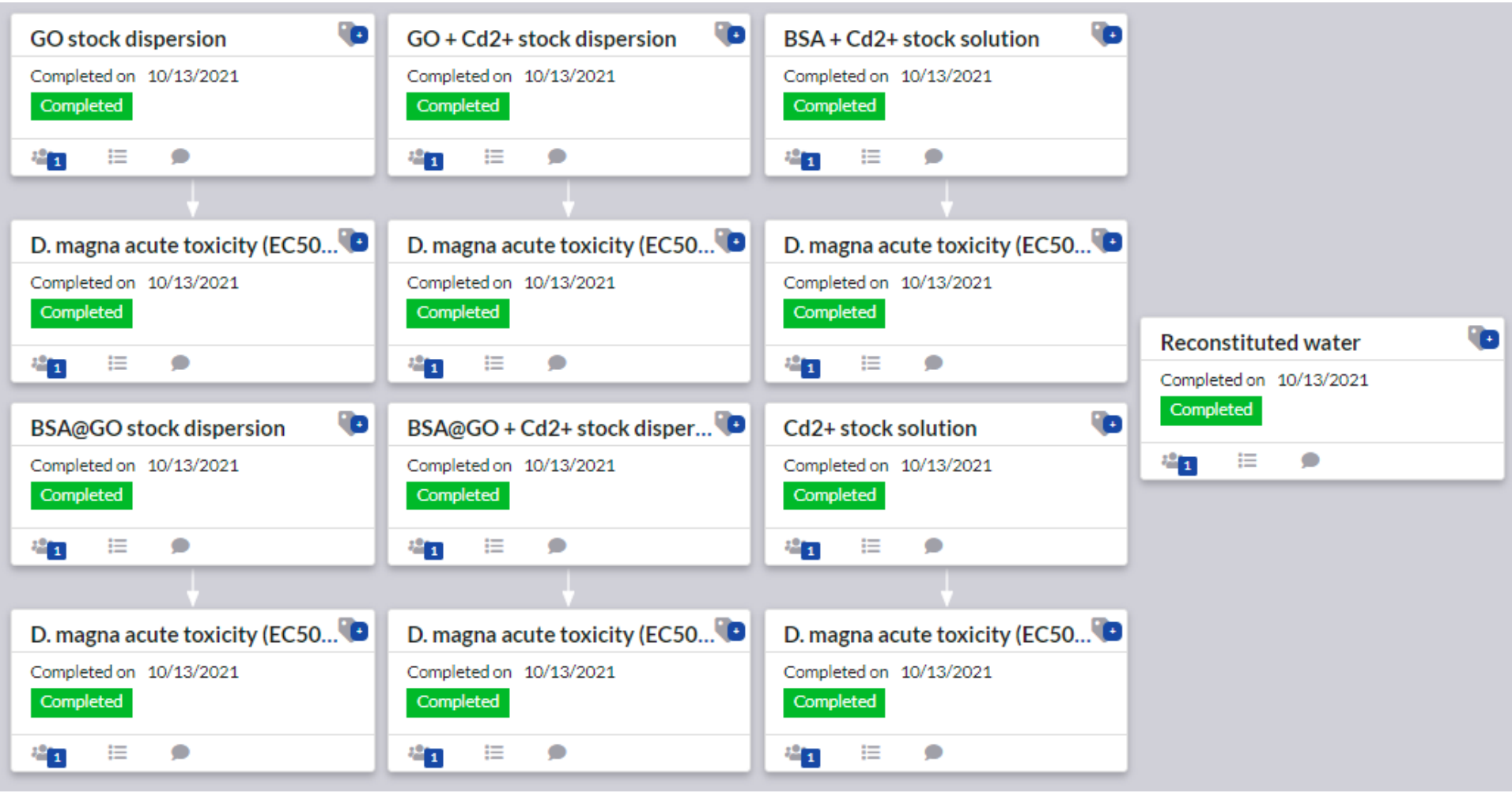
Source: Martinez et al. Nanomaterials 2020, 10(10), 1936

Electronic laboratory notebooks



Source: Martinez et al. Nanomaterials 2020, 10(10), 1936

Electronic laboratory notebooks



Source: Martinez et al. Nanomaterials 2020, 10(10), 1936

Electronic laboratory notebooks

NanoCommons
Nano-Knowledge Community

Keep in mind

- ELNs are better than paper notebooks
- ELNs are not a complete data management solution
- ELNs should be part of a data management ecosystem
- ELNs are to be used in conjunction with knowledge bases, semantic annotation etc.
- More work is needed to integrate all the different parts and create a fully functional working environment

NanoCommons

Nano-Knowledge Community

Thank you

Contact:
A.Papadiamantis@bham.ac.uk