

NANOMATERIALREGISTRY

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NANOMATERIALREGISTRY

A tool for the storing, sharing, and analysis of data from the nanomaterial community

WELCOME TO THE NANOMATERIAL REGISTRY!

The Nanomaterial Registry is a one-stop, authoritative, fully curated resource that provides information on the biological and environmental implications of well-characterized nanomaterials.

The Nanomaterial Registry is being built through strong collaborations with broad stakeholder groups that represent the diverse nanomaterial community, including industry, regulatory institutions, government, and academia. [LEARN MORE ABOUT OUR VISION >](#) [WHAT IS CURATED DATA? >](#)

Nanomaterial Registry

Minimal Information Standards

Compliance Levels

Instance of Characterization

Matching & Similarity

Comparison

BROWSE NANOMATERIALS



Material Type >



Size >



Shape >



Surface Area >

A TOOL FOR THE NANOMATERIAL COMMUNITY

An authoritative website that compiles data from multiple databases into a single resource, the Nanomaterial Registry (NR) provides tools for analyzing and comparing data on the biological and environmental implications of well-characterized nanomaterials. This resource will evolve as the quality and quantity of the information on nanomaterials improve. Hundreds of nanomaterial entries have been curated into the NR for physico-chemical characteristics and are available to the public. Biological and environmental study data for existing nanomaterial entries will also be curated into the NR.

To access this information, search or browse the database using the buttons on this home page. From a query results table, you can request

LATEST NEWS

June 2012 • The Greener Nano 2012: Nanoinformatics Tools and Resources Workshop, will be held in Portland, OR, July 30th...
[Read more](#)

May 2012 • The U.S. Government Accountability Office has released a report, [The Nanomaterials...](#)

Funded by:



NIH

NIBIB

NATIONAL
CANCER
INSTITUTE

Web Address:

www.nanomaterialregistry.org

RTI
INTERNATIONAL

Registry as a Tool

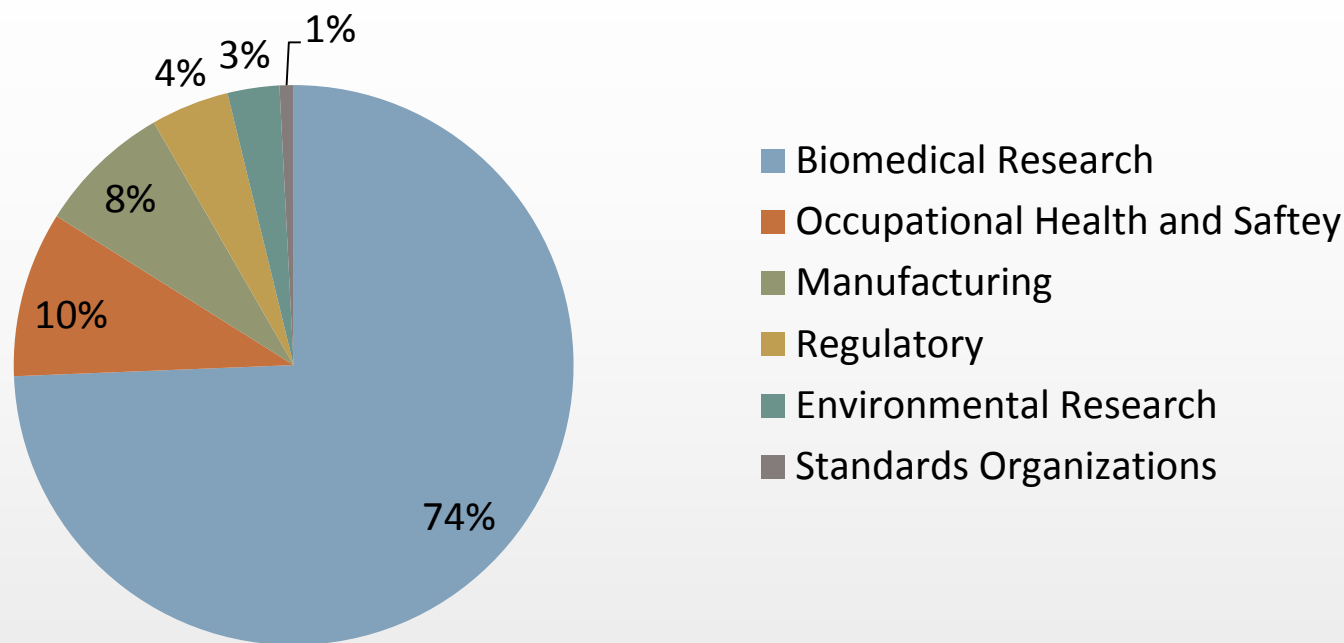
End Users:

- Nanomaterial researchers who generate or analyze data
 - SME's who make research decisions/guide research
 - Groups that want to share data globally
- DATA ACCESS – What research is being done, finding data with specific PCC or endpoints
 - DATA ANALYSIS – extracting data sets across resources, modeling
 - REVIEWING DATA STANDARDS – What are protocols and best practices, what should be reported
 - DIRECTING RESEARCH – Where are gaps in existing research, what are the data rich areas

Authoritative Data

- Organize and archive data using systematic curation tools and methods
 - Controlled vocabulary
 - Using a minimal information about nanomaterials (MIAN)
 - Data model
 - Curation tool
- To impart the highest degree of authoritativeness to the data
 - QA & QC reviewers
 - Product Life
- Curation = Data validation and quality

Data Records



Stakeholder Group	Data Records
Biomedical Research	1018
Occupational Health and Safety	131
Manufacturing	106
Regulatory	62
Environmental Research	41
Standards Organizations	11

Minimal Information about Nanomaterials
For Physico-Chemical Characteristics

MIAN PCC

MIAN for Physico-Chemical Characteristics



Composition



Size



Size Distribution



Shape



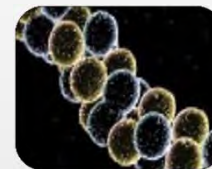
**Aggregation/
Agglomeration State**



Surface Area



Surface Charge



Surface Chemistry



Surface Reactivity



Purity

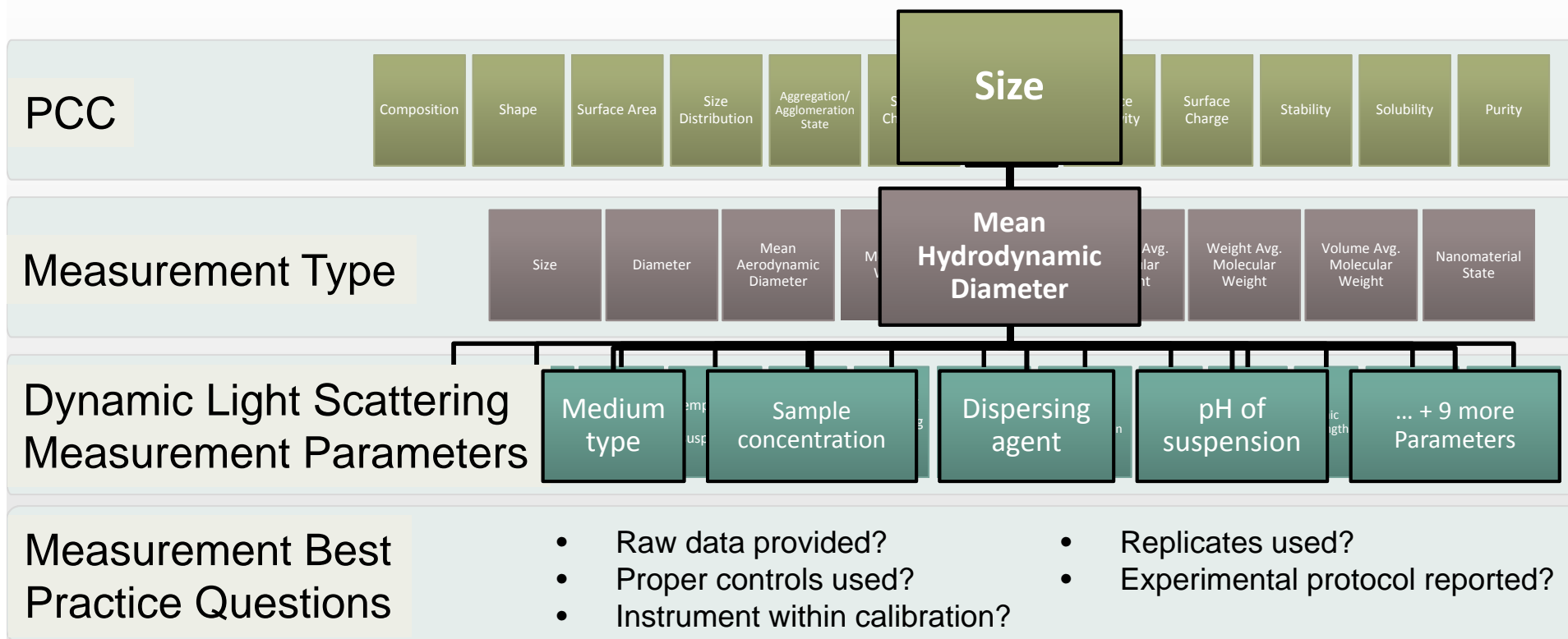


Solubility



Stability

Metadata in the MIAN



Minimal Information = PCC data + Metadata

Metadata in the MIAN

NR963

NR Descriptor: Au NP
 Information for this nanomaterial was curated from National Institute of Standards and Technology
 Original Publication(s): Not reported
 Information reported: PCC Characterization? Yes Environmental interactions? No

CURATED DATA BASED ON INSTANCE OF CHARACTERIZATION

AS RECEIVED

Nanomaterial State: liquid suspension
 Manufacturer: National Institute of Standards & Technology
 Product Name: Reference Material 8011
 Synthesis Method: citrate reduction

PHYSICO-CHEMICAL CHARACTERISTICS

Particle Size

Mean Hydrodynamic Diameter: 13.5 nm +/- 0.1 nm
 Dynamic Light Scattering

Mean Hydrodynamic Diameter: 9.1 nm +/- 1.8 nm
 Small Angle X-Ray Scattering

Mean Hydrodynamic Diameter: graphically represented
 Intensity Weighted: Field Flow Fractionation

Composition

OVERALL NANOMATERIAL

Molecular Identity: UV-Visible Spectroscopy
 Lambda Max: 517 nm

Best Practice Questions

BEST PRACTICES

- Instrument Manufacturer: Malvern
- Instrument Model: Zetasizer Nano ZS
- Raw Data Provided: Not reported
- Proper Controls Used: Not reported
- Instrument within Calibration: Yes
- Number of Replicates: 40
- Protocol Reported: Not reported
- Protocol Citation: ISO 13321:1996(E)
- Protocol Modifications: Not Reported

Measurement Parameters

PROTOCOL & PARAMETERS

- Temperature of Suspension: 20 +/- 0.1 C
- Algorithm Used: cumulants
- Viscosity: 1.0031 mPa*s
- Solvent/Medium Type: water
- Dispersing Agent: NaCl
- Concentration of Dispersing Agent: 2 mM
- Sample Concentration: diluted 6-fold
- Sonication/Milling Power: none
- Sonication/Milling Time: none

NIST Reference Material 8011 – Citrate stabilized Au NP

Compliance Ratings

NANOMATERIALREGISTRY^{BETA}

ABOUT THE REGISTRY | RESOURCES | CONTACT US | DATABASE SEARCH

Home • Search • Search Results

SEARCH RESULTS

5 RESULTS FOUND FOR REFERENCE MATERIAL

Arrange by ▾ CLEAR COMPARISON SELECTION

YOUR CURRENT KEYWORD SEARCH

reference material

Also search within words, phrases, or formulas.

NARROW YOUR SEARCH

Size MORE ▸

Size Distribution

Surface Area MORE ▸

Shape MORE ▸

Composition MORE ▸

Purity MORE ▸

Surface Charge MORE ▸

Surface Chemistry

	PCC COMPLIANCE	PARTICLE SIZE	SIZE DISTRIBUTION	AGGREGATION / AGGLOMERATION STATE	SURFACE AREA	SHAPE	COMPOSITION	PURITY	SURFACE CHARGE	SURFACE CHEMISTRY	SURFACE REACTIVITY	SOLUBILITY
NR963 - Au NP												
NR964 - Au NP												
NR968 - TiO2 NP												
NR970 - polymer NP												
NR971 - polymer NP												

COMPLIANCE LEVELS





Gold

Silver

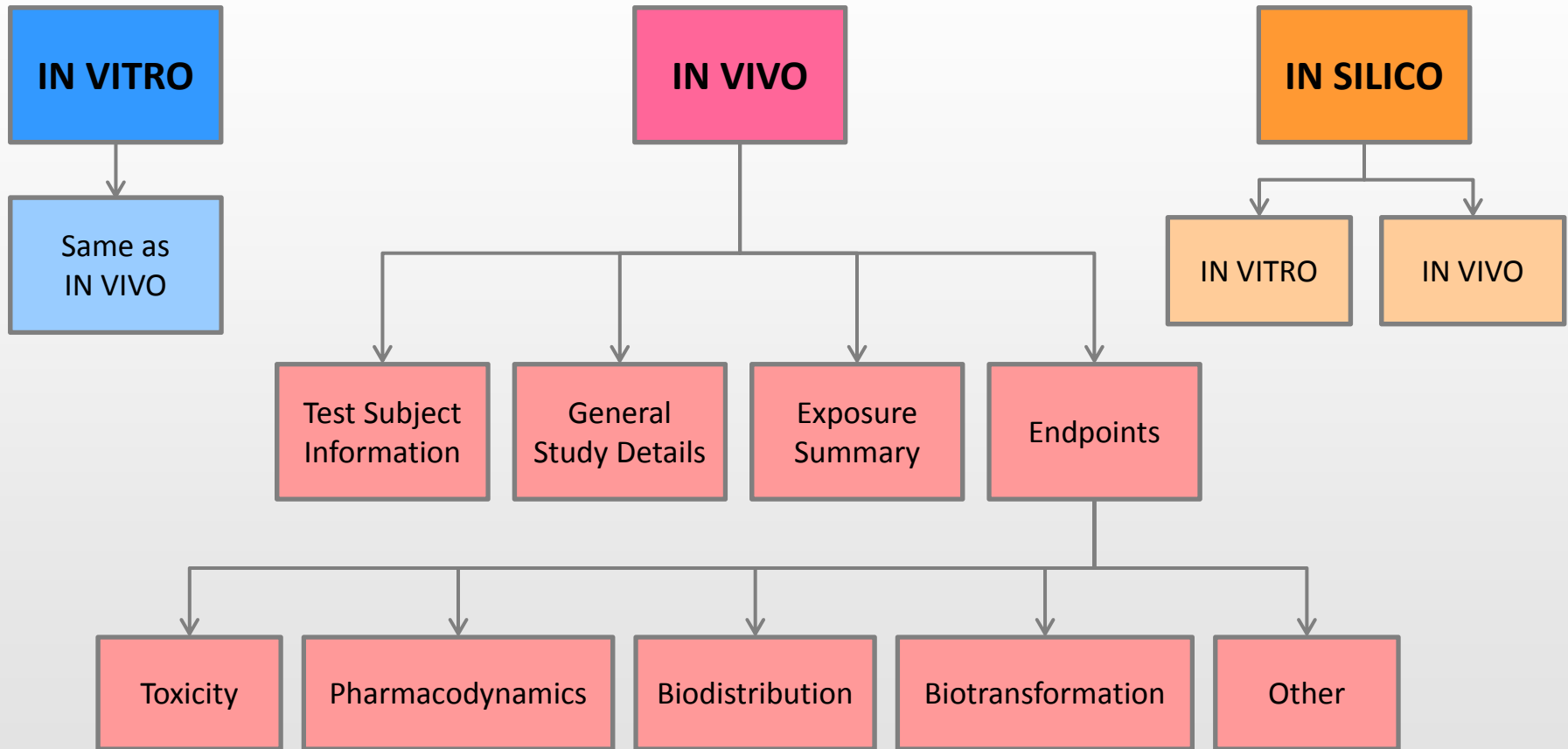
Bronze

Merit

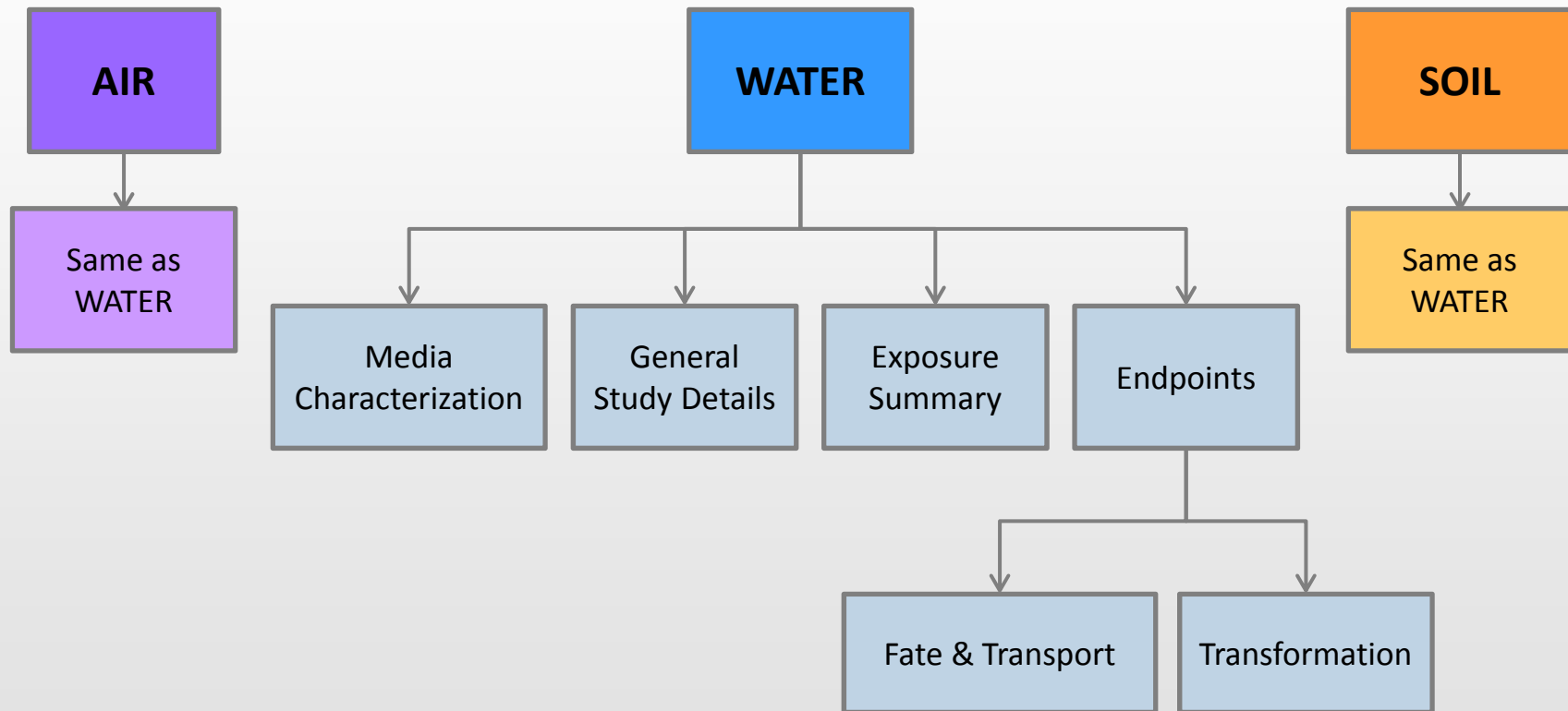
Compliance Example for PCC of Size

Curated Data:	Size= 37.5 nm	Size= 37.5 nm	Size= 37.5 nm	Size= 37.5 nm
		Mean Hydrodynamic Diameter	Mean Hydrodynamic Diameter Dynamic Light Scattering Malvern Zeta Sizer Nano ZS	Mean Hydrodynamic Diameter Dynamic Light Scattering Malvern ZetaSizer Nano ZS ✓ 11 of 12 measurement parameters reported Protocol: ASTM E2490 - 09
Compliance Score:	16.5%	38.5%	60.4%	78.0%
Compliance Level:	Merit 	Bronze 	Silver 	Gold 

Data Domain: Biological Studies

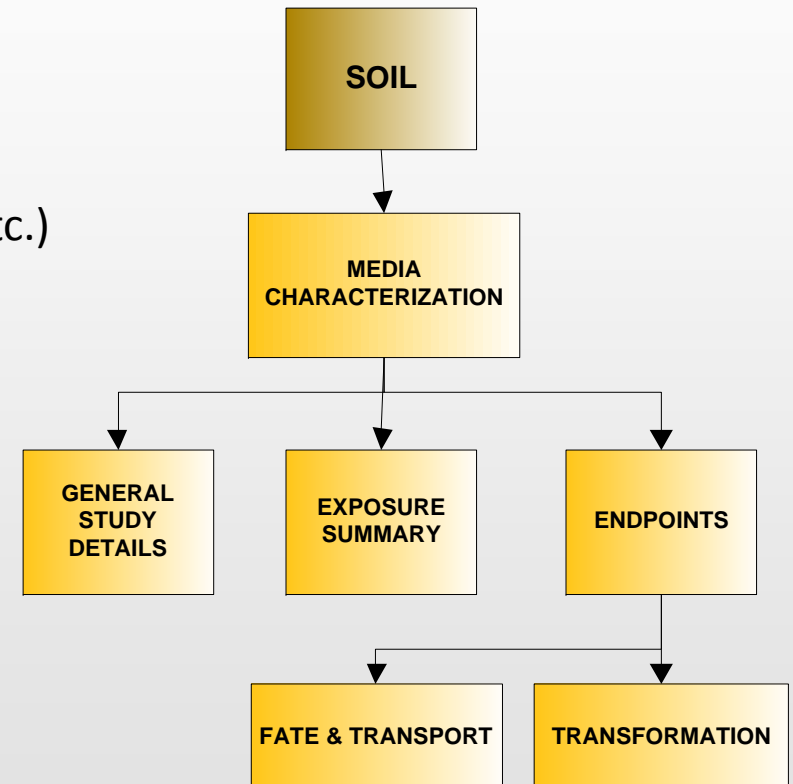


Data Domain: Environmental Studies



Example: Soil Fate & Transport

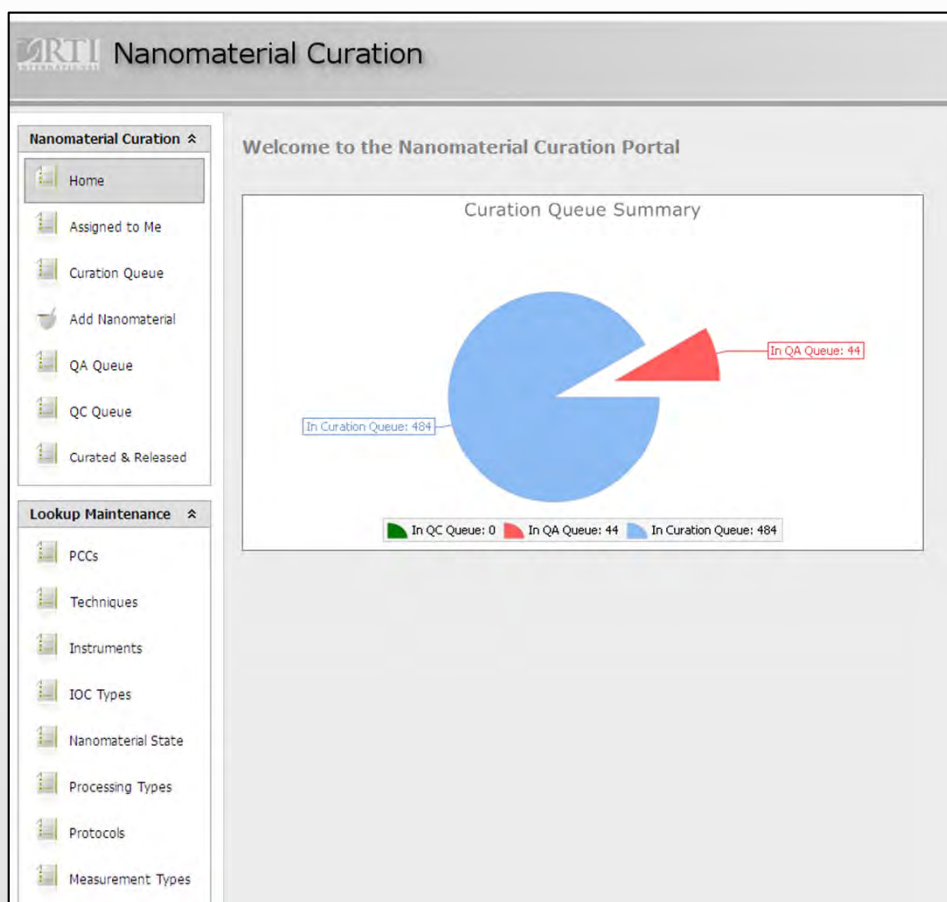
- Information Captured:
 - Media Characterization
 - Soil Type
 - Soil Details (moisture, pH, void volume, etc.)
 - Total Weight or Volume
 - General Study Details
 - Test Location
 - Controls? Standard Protocol Used?
 - Assay Used
 - Exposure Characterization
 - Nanomaterial Exposure Concentration
 - Study Results
 - Fate & Transport Level
 - Transformation



Accelerating the Curation Process
Minimizing Error Propagation

CURATION TOOL

Curation Tool



- Errors are mitigated
 - Dropdowns available for many fields
 - Preview option to view data as displayed on website
- Notifications on queues
- Access control
- Workflow management
 - Curation → Quality Assurance
→ Quality Control

Curation of an Entry

RTI Nanomaterial Curation Welcome kmills! [[Log Out](#)] [[Change Password](#)]
ver 2.7.0

Nanomaterial Curation

- Home
- Assigned to Me
- Curation Queue
- Add Nanomaterial
- QA Queue
- QC Queue
- Curated & Released

Lookup Maintenance

- PCCs
- Techniques
- Instruments
- IOC Types
- Nanomaterial State
- Processing Types
- Protocols
- Measurement Types

Step 1: Enter General Nanomaterial Information

General | Original Research Publications

*DB Name: NRID: NA

*DB Entry Name: *NR Descriptor: A

*Data Source ID: *DB Entry URL: h

*Status:

Step 2: Save General Nanomaterial Info

Step 3: Enter Instance of Characterization

*IOC Type: Timepoint:

Predecessor: Nanomaterial State:

Manufacturer Name: Laboratory Name:

Product Name: Lot Number:

Synthetic Method: DOI Reference to Synthesis:

Processing Type:

Old TOM Desc:

IOCs for this Nanomaterial												
#	Studies	IOCID	IOC Type	TimePoint	Predecessor	Nanomaterial State	Manufacturer	Product Name	Laboratory	Lot Number	Synthetic Method	DOI Referre
<input type="radio"/>		452	As Synthesized			liquid suspension	nanoComposix, Inc.	PVP NanoXact Silver		EAW1125		
<input type="radio"/>		453	As Processed A			powder	nanoComposix, Inc.	PVP NanoXact Silver		EAW1125		

Curation is guided with steps for every major action:

1. Enter General Information
2. Save
3. Enter Instance(s) of Characterization
4. Save
5. Enter PCC Data for each IOC
6. ...

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Curation Tool: Tracking the Workflow

- PCCs
- Techniques
- Instruments
- IOC Types
- Nanomaterial State
- Processing Types
- Protocols
- Measurement Types
- Measurement Units
- Picklists

Administration ^

- View Users
- Maintain Roles
- Notification Testing

As Processed A		Mean Diameter: 7.7 nm Protocol Values	1.6 Standard Deviation	Electron Microscopy	Name: Electron Microscope Model Name: 1010	Reported	Reported	Reported	Reported	Reported	Reported
As Processed A	Size Distribution	Modality: monomodal 0 Protocol Values		Transmission Electron Microscopy	Name: Transmission Electron Microscope Model Name: 1010	Not Reported	Not Reported	Not Reported	Not Reported	not reported	not reported
As Processed A	Aggregation / Agglomeration State	State: not aggregated / agglomerated 0 Protocol Values		Transmission Electron Microscopy	Name: Transmission Electron Microscope Model Name: 1010	Yes	Not Reported	Not Reported	Not Reported	not reported	Not Reported
As Processed A	S					No	No	Not Reported	No	not reported	Not Reported
As Synthesized	C					No	Not Reported	Not Reported	Not Reported	not reported	Not Reported
As Synthesized	S					Not Reported	Not Reported	Not Reported	Not Reported	not reported	Not Reported
As Synthesized	S					Not Reported	Not Reported	Not Reported	Not Reported	not reported	Not Reported

Workflow History

Status	Updated By	Date Updated	
Under QA Review	dmurry	11/14/2012	dmurry@rti.org
In Curation Queue	dmurry	10/9/2012	dmurry@rti.org
In Curation Queue	dmurry	10/9/2012	dmurry@rti.org
In Curation Queue	dmurry	10/9/2012	dmurry@rti.org

Bio/Env Curation

In Vivo Study 1

Study Area	Display Order	#	
⊖ Test Subject		1	Edit New Delete

Study Section	Display Order	#	
⊖ Test Subject 1		1	Edit New Delete

Item Name	Item Type	Display Order	Value	Edit	Delete
Animal Type	Subsystem	1	Aquatic - freshwater: fish	Edit	Delete
Common Name	String	3	Zebra Fish	Edit	Delete
Species	String	4	Danio rerio	Edit	Delete
Number of Animals	Numeric	7	24 per group	Edit	Delete
Life stage	Multiselect	9	embryo	Edit	Delete
Age	Numeric	10	8 hours post fertilization	Edit	Delete
Weight	Numeric	11	1 mg	Edit	Delete
Sex	Multiselect	12	female, male	Edit	Delete

[New](#)

⊕ General Study Details	2	Edit New Delete
⊕ Exposure Summary	3	Edit New Delete
⊕ Endpoint	4	Edit New Delete

- In vivo template for curation (showing NBI data)

Browse

Search

Compare

Find Similar Nanomaterials

WEBSITE FEATURES

Applied MIAN

Search

with biological and environmental
Degree of Similarity is based on s

ed. Currently,
EARN MORE ▶

68+12,648
 $(\frac{2}{5} + \frac{1}{5}) = 0.508$

Nanomaterial Registry Minimal In
Stand

Buckyball Matching & Similarity

Nanotube
Graphene SWCNT
Graphite MWCNT
FWCNT

that compiles data from multiple databases into a
Nanomaterial Registry (NR) provides tools for analyzing
the biological and environmental implications of
nanomaterials. This resource will evolve as the quality
of information on nanomaterials improve. Hundreds of
nanomaterials have been curated into the NR for physico-chemical
properties and are available to the public. Biological and environmental
nanomaterial entries will also be curated into the NR.

Browse

COMPARISON

three data sets
can be compared

COMPARISON OF NANOMATERIAL DATA BASED ON INSTANCE OF CHARACTERIZATION

Name	NR27	NR40	NR207
Instance of Characterization Description	As Synthesized	As Synthesized <i>dissolution</i>	As Specified
General Information	Data Source: <i>NIL</i> Original Research Publication: Reported	Data Source: <i>NIL</i> Original Research Publication: Reported	Data Source: <i>CaNanoLab</i> Original Research Publication: Rep
Particle Size	Diameter: • Graphically Represented <i>Scanning Electron Microscopy</i>	Mean Primary Particle Size: • 24 nm <i>Scanning Electron Microscopy</i> • Graphically Represented <i>Scanning Electron Microscopy</i> Thickness: • Graphically Represented <i>Scanning Electron Microscopy</i>	Diameter: • 13 nm
Aggregation / Agglomeration State	Aggregation/Agglomeration State: • Aggregated/Agglomerated <i>Scanning Electron Microscopy</i>		

Side by side
comparison

Find Similar Nanomaterials

NANOMATERIALREGISTRY BETA

ABOUT THE REGISTRY | RESOURCES | CONTACT US | DATABASE SEARCH

Home • Search • Nanomaterial Details

NR52

NR Descriptor: PbS NP
 Information for this nanomaterial was curated from *NIL*.
 Original Publication(s): Not reported
 Information reported: PCC Characterization? Yes Environmental interactions? No Biological interactions? No

CURATED DATA BASED ON INSTANCE OF CHARACTERIZATION [Find similar nanomaterials ▶](#)

NTHEISIS, 0.5 HOURS

CO-CHEMICAL CHARACTERISTICS | **BIOLOGICAL INTERACTIONS** | ENVIRONMENTAL INTERACTIONS

Mean Primary Particle Size: 3.34 nm
Transmission Electron Microscopy ✓

[Find similar nanomaterials ▶](#)

NANOMATERIALS SIMILAR TO NR52

Arrange by ▶ CLEAR COMPARISON SELECTION

COMPLIANCE LEVELS
 Gold Silver
 Bronze Merit

	SIMILARITY	PCC COMPLIANCE	PARTICLE SIZE	SIZE DISTRIBUTION	AGGREGATION/ AGGLOMERATION STATE	SURFACE AREA	SHAPE	COMPOSITION	PURITY	SURFACE CHARGE	SURFACE CHEMISTRY	SURFACE REACTIVITY	SOLUBILITY	STABILITY	ENVIRONMENTAL	BIOLOGICAL
NR13 - Pt NP	30%	👤	👤			👤	👤									<input type="checkbox"/>
NR39 - buckey ball	30%	👤	👤			👤	👤									<input type="checkbox"/>
NR43 - FeOx NP	30%	👤	👤	👤		👤	👤									<input type="checkbox"/>
NR82 - CdSe QD	30%	👤	👤			👤	👤									<input type="checkbox"/>
NR83 - CdSe QD	30%	👤	👤			👤	👤	👤								<input type="checkbox"/>
NR120 - Mo NP	30%	👤	👤		👤	👤	👤	👤								<input type="checkbox"/>
NR121 - Zn NP	30%	👤	👤		👤	👤	👤	👤								<input type="checkbox"/>
NR141 - CdSe QD	30%	👤	👤			👤	👤	👤			👤					<input type="checkbox"/>
NR142 - CdSe QD	30%	👤	👤			👤	👤	👤			👤					<input type="checkbox"/>
NR143 - CdSe QD	30%	👤	👤			👤	👤	👤			👤					<input type="checkbox"/>

Upcoming Features

- Data visualization tools
 - data pattern and trend recognition
- Data export tool
- User accounts/profiles for
 - Saved queries
 - Custom data visualizations
 - Saved data export settings
 - Other custom settings
- Semantic Search

Additional Opportunities

- Public data submission tool
 - Open source option for file upload
 - Wizard-style custom design

DISCUSSION

Questions for the CoR

- What are the CoR's valued endpoints for biological and environmental systems?
- What resources will the CoR use for models on nanomaterials exposure?