Ontology-enabled Polymer Nanocomposite Open Community Data Resource

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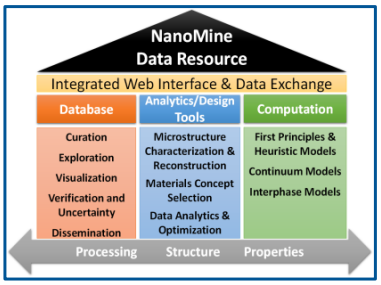
Overview of NanoMine

NanoMine is an open access, user friendly, living, growing, data resource for the polymer nanocomposites community that is scalable and enables improved understanding of processing – structure - property relationships and thus facilitates faster nanocomposite design and insertion into advanced applications. By bringing together the data that is scattered throughout the public literature and private files and creating a protocol for recording and tagging data, this resource is an unprecedented compilation of information that is accessible. Tools within the resource allow users to visualize complex data, analyze images from their work, and design new polymer nanocomposites materials.

Research Highlights

NanoMine Data Resource

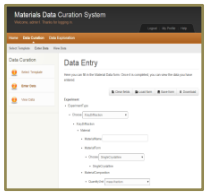


http://nanomine.northwestern.edu

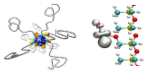
Nanocomposite Materials Data Curation in NoSQL

XML schema

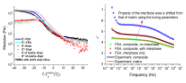
MongoDB & Python Django Frontend



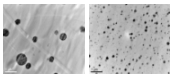
Material Compositions



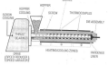
Material Properties



Micrograph Images



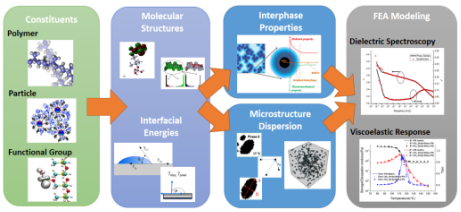
Processing Information



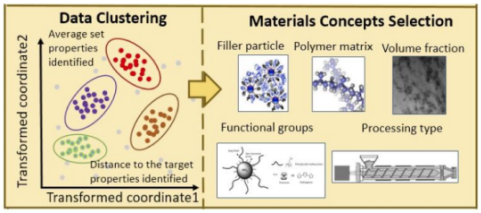
Most Significant Successes

- 85 papers included in NanoMine under a consistent Schema
- Characterization tools available to the community Multiscale models
- Preliminary XML schema developed,
- Developing an Ontology

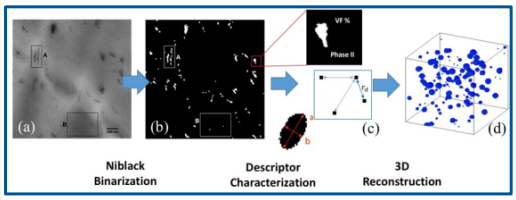
Multi-scale Modeling



Data Driven Materials Design

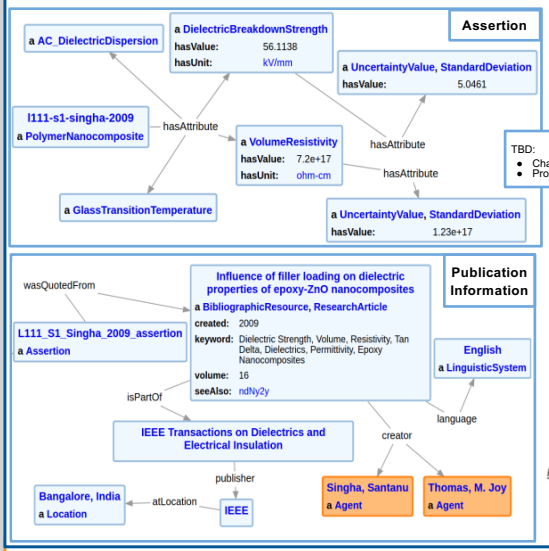


Statistical Microstructure Analysis

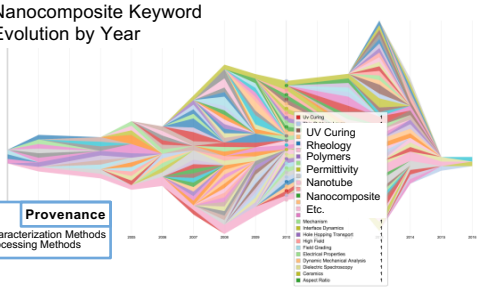


Ontology Development, Knowledge Maps, Visualization

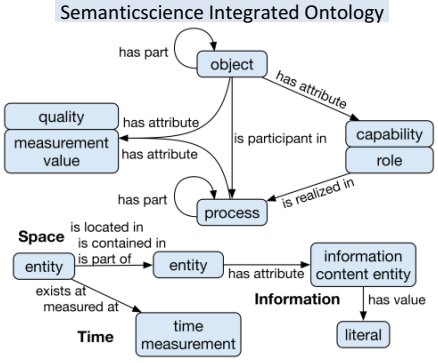
Encoding Knowledge in Nanopublications: Assertion, Provenance, and Publication



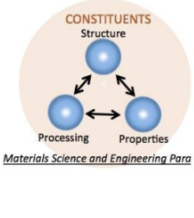
Nanocomposite Keyword Evolution by Year

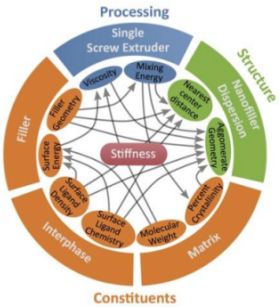


Building on semantic science foundations, including the Semanticscience Integrated Ontology



Concept Understanding





- Expanding to an RDF/XML schema that includes extensions for custom data and support for versioning so that existing documents can be automatically updated to the current schema without data loss or manual intervention
- Developing an ontology based on our schema that uses existing standards to encode uploaded data and results as manageable units of experimentally or computationally supported knowledge, called Nanopublications
- An interface that facilitates broadening the NanoMine user community
- Integration of existing visualization tools into NanoMine

RESEARCH PLANS for 2017