Role of MITS-NIMS to Development of Materials Database

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- Current projects
- Future plan

Introduction to MITS-NIMS

- Material Information Technology Station (MITS) of National Institute for Materials Science (NIMS)
- Location: Tokyo, Japan
- Since October 2001

MITS-NIMS

Activities 1

- **Fact data production**

Creep
(10, 20, 30 years)

Fatigue
(10^{10} cycles)

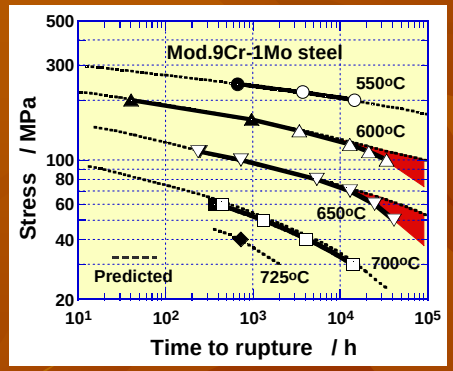
Corrosion
(10 years)

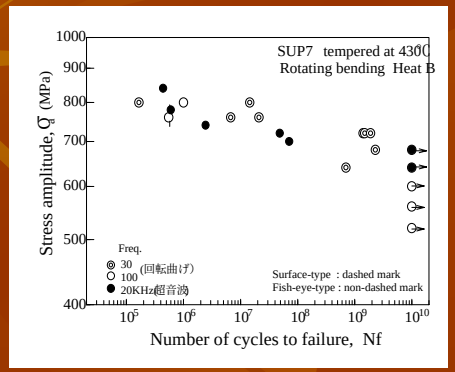
rocket material

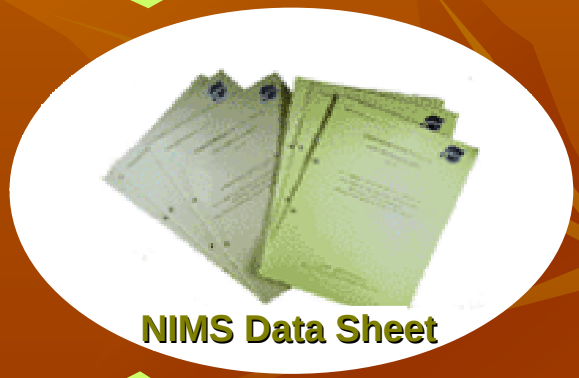
MITS-NIMS

Activities 2

- **Fact data publication**







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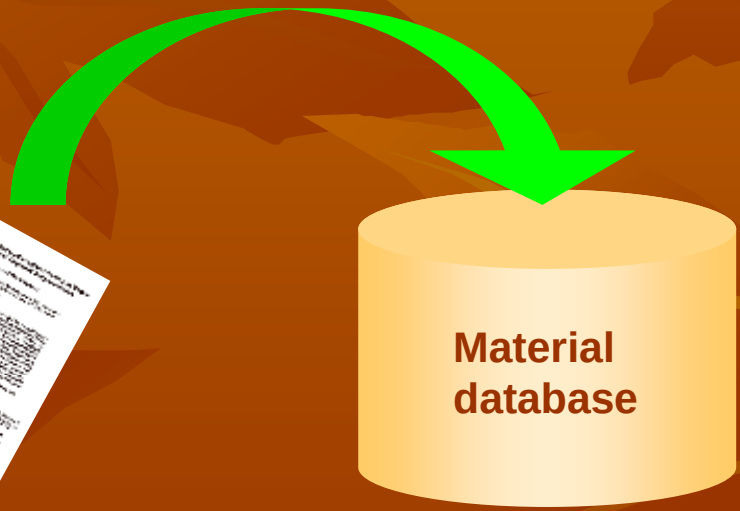
Activities 3

- **Literature data acquisition**

Research papers



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Activities 4

- **Data service**

Superconducting materials database

Data free way (nuclear materials)

Structure materials database

Welding database

From April 2003

basic DB (Pauling File)

diffusion DB

3D phase diagram DB

metal structure graphic DB

polymers DB (PolyInfo)

pressure vessel materials DB

electronic structure DB

MITS-NIMS

Certification – ISO9001:2000

QS Registration
JUSE-RA-589

ISO9001 : 2000

For data sheet, experiment and accident investigation

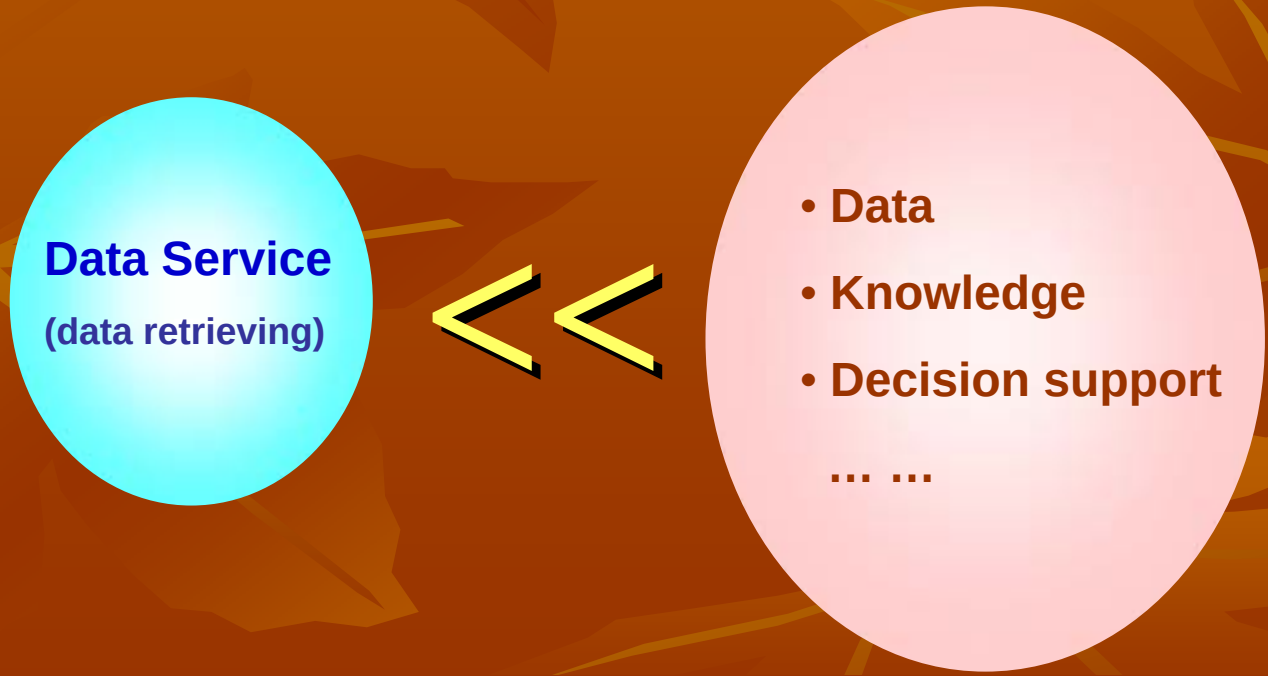
MITS-NIMS

Research & Development

- **Problem to resolve**

Material information service

Material information requirements



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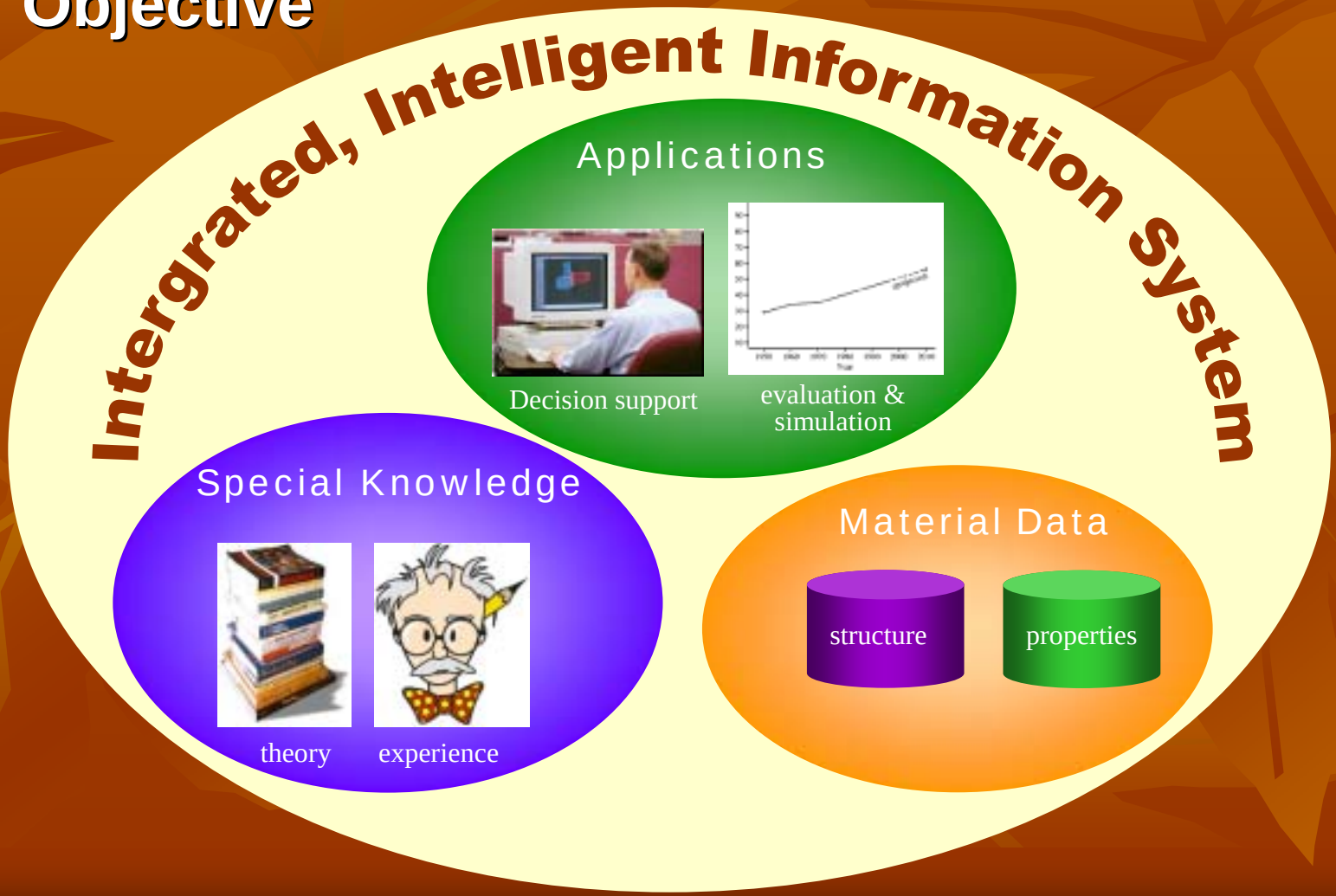
Research & Development

- **Objective**



Current projects

1. Material risk information platform
2. Material design and property prediction system for composite

Project-1

Material Risk Information Platform

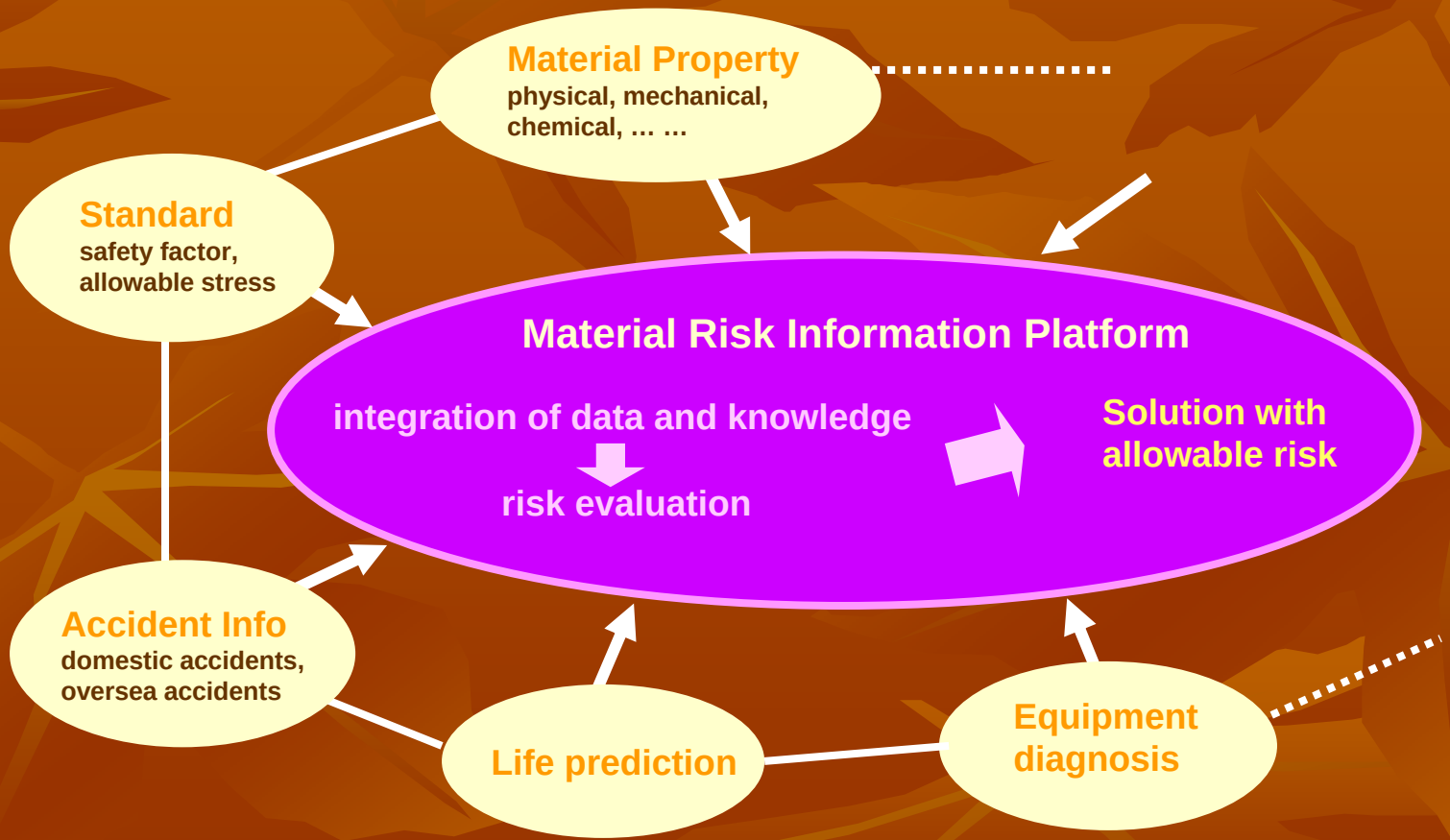
(April 2001 – March 2006)

- **Purpose**
  - To provide **knowledge and solutions** for material safe use and selection
    - Target: materials used for power plant, boiler
    - Risk factors: corrosion, fatigue, fracture toughness, creep, etc.

Project-1

Material Risk Information Platform

- **Platform schematic**



Project-2

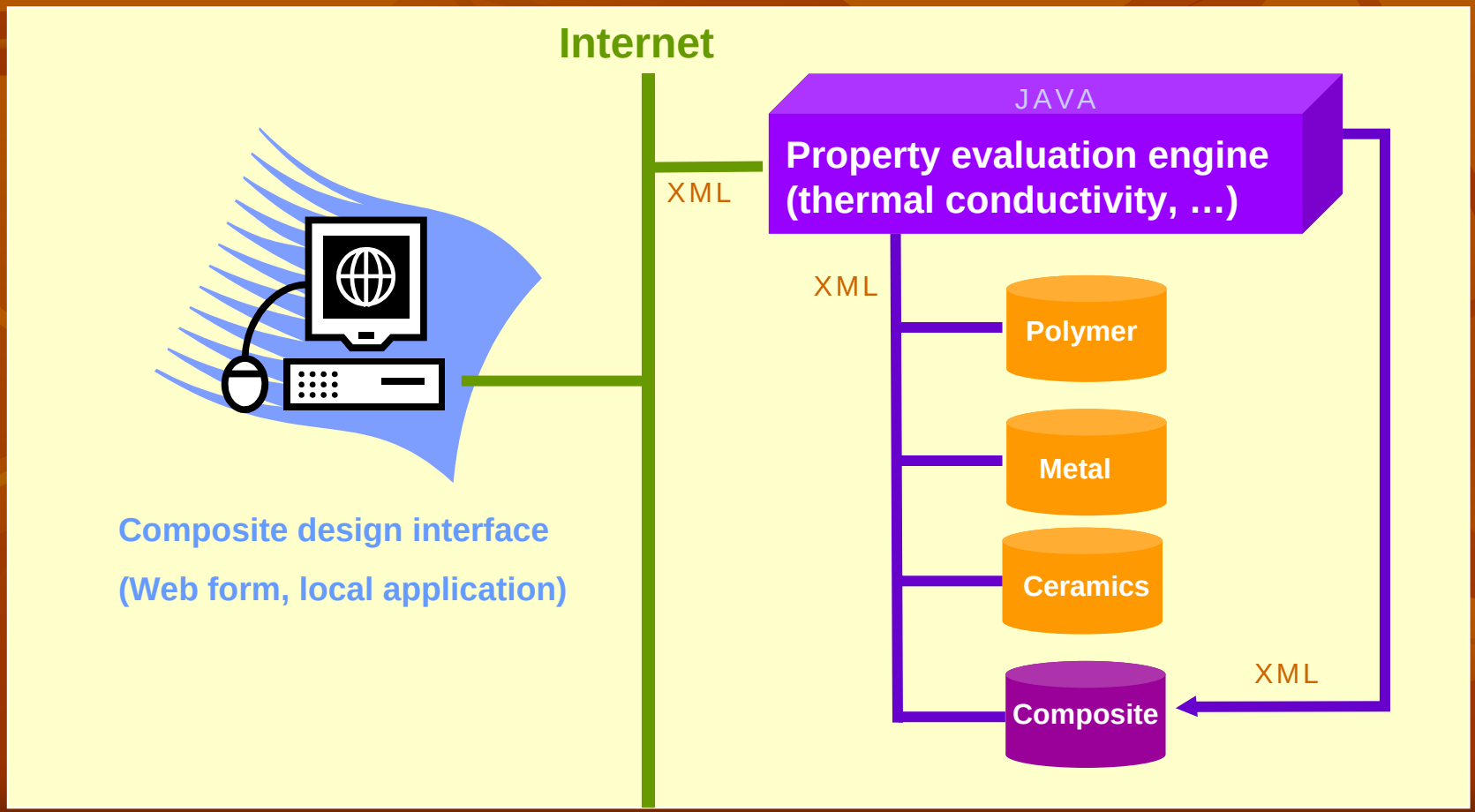
Material Design and Property Prediction System for Composite (April 2002 – March 2005)

- Purpose
  - An information provider and decision support system for composite material design

Project-2

Material Design and Property Prediction System for Composite

- System schematic



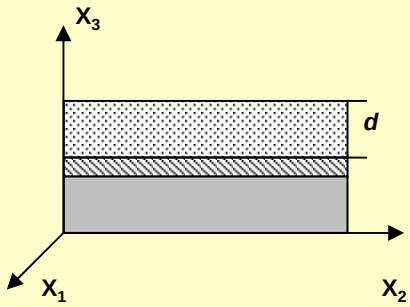
Project-2

Material Design and Property Prediction System for Composite

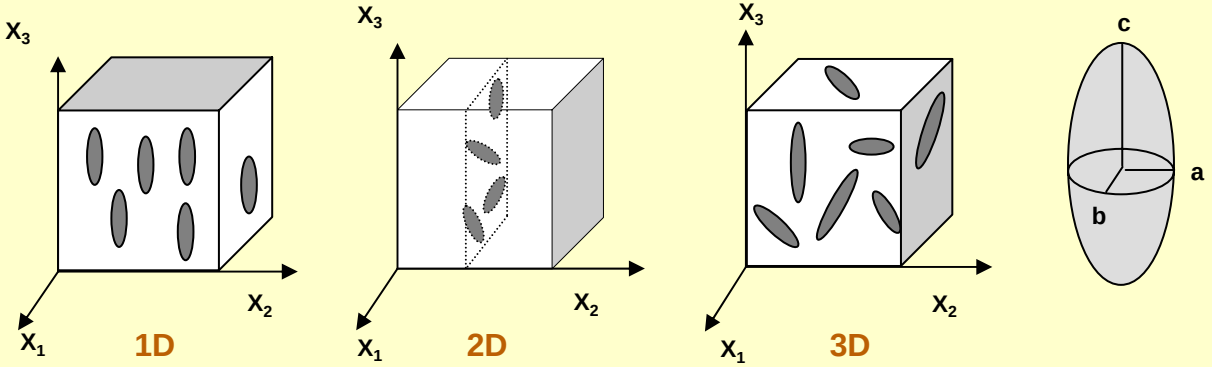
- XML description of composite

Structure models of composite

laminate

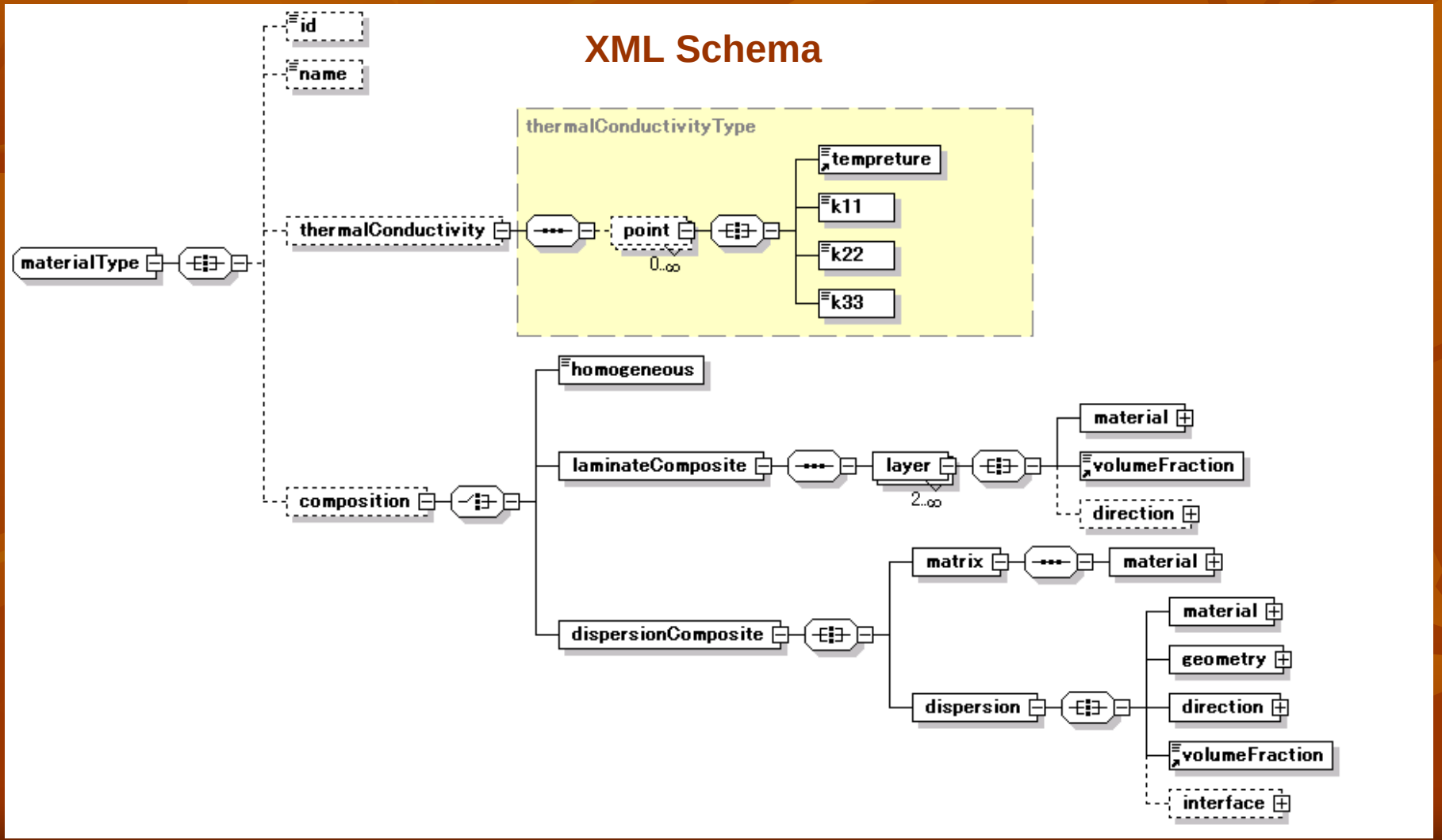


dispersion



Project-2

Material Design and Property Prediction System for Composite



Project-2

Material Design and Property Prediction System for Composite

- Thermal conductivity evaluation engine
  - Calculating with analytical solutions
  - High-speed, light-weight

Project-2

Material Design and Property Prediction System for Composite

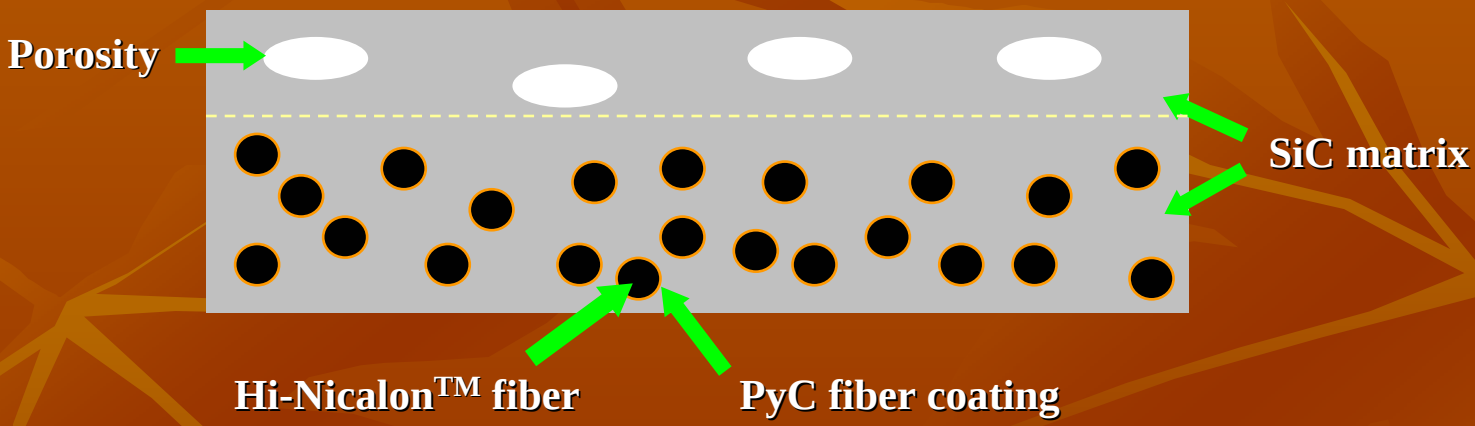
- **Thermal conductivity calculation methods**

Analytical solutions	Composite's structure	Interfacial thermal resistance
Wiener	Laminate Parallel arrangement, Serial arrangement	No
Hatta-Taya	Dispersion 1D, 2D, 3D distribution	No
Hasselman-Jhon	Dispersion Long fiber, 1D distribution	Yes (thin)
Markworth	Dispersion Long fiber, 1D distribution	Yes

Material Design and Property Prediction System for Composite

- **Demo of thermal conductivity evaluation**

Sample: 2D-Hi Nic/PyC/ICVI-SiC composite



Structure model → XML file → Thermal conductivity evaluate

Material Design and Property Prediction System for Composite

- **Summary**
  - A specification has been made for describing constitution and thermal conductivity of a composite by XML.
  - A thermal conductivity evaluation engine has been developed.

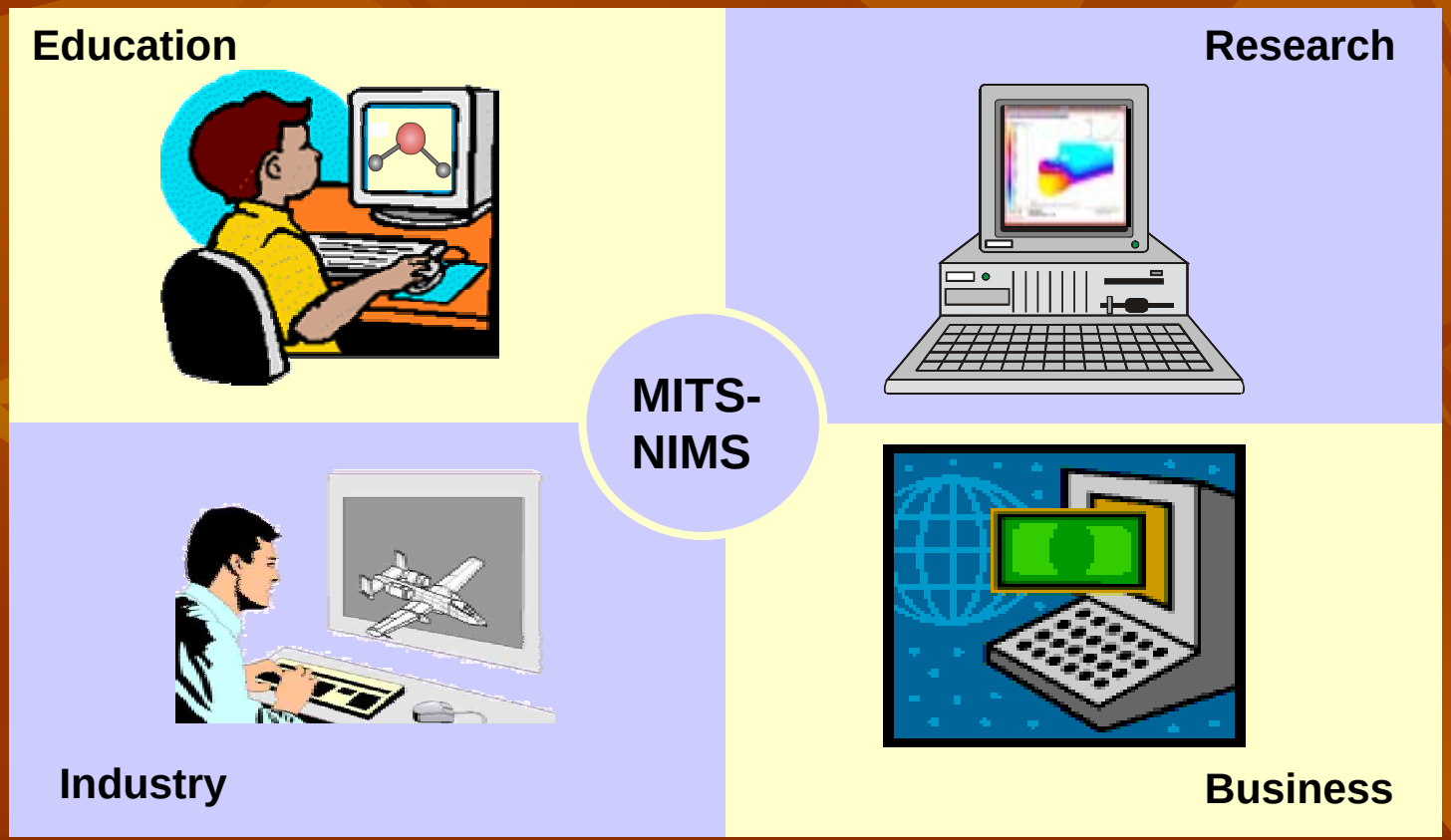
Project-2

Material Design and Property Prediction System for Composite

- Research in progress
  - Data retrieving from distributed databases
  - Material design interface
  - Evaluation of other properties

Future plan (1)

- **Standardization**
  - An open material information platform



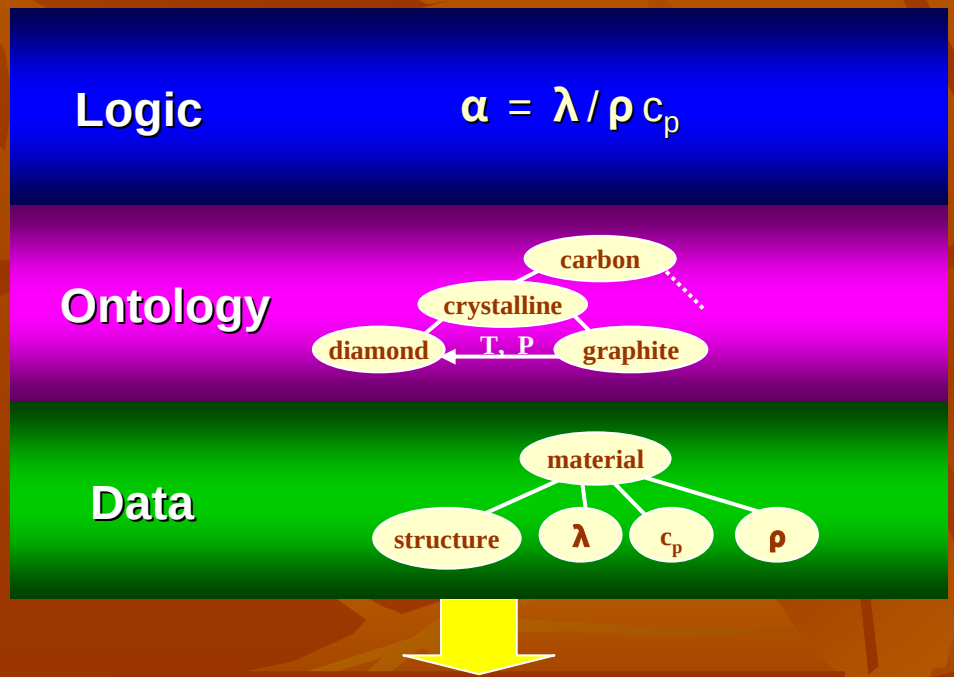
Future plan (2)

- **Semantic database**
  - Object-oriented, multi-layer information architecture

Present database

material	λ	c_p	ρ
diamond			
graphite			

Semantic database



Comprehensive & Intelligent

For more information

- http://www.nims.go.jp/mits
- http://www.nims.go.jp/mits/datasheet.html
- http://www.nims.go.jp/nims/database.html
- http://www.nims.go.jp/materials_risk/