



Naval Research Laboratory - Office of Naval Research
Materials Science and Technology

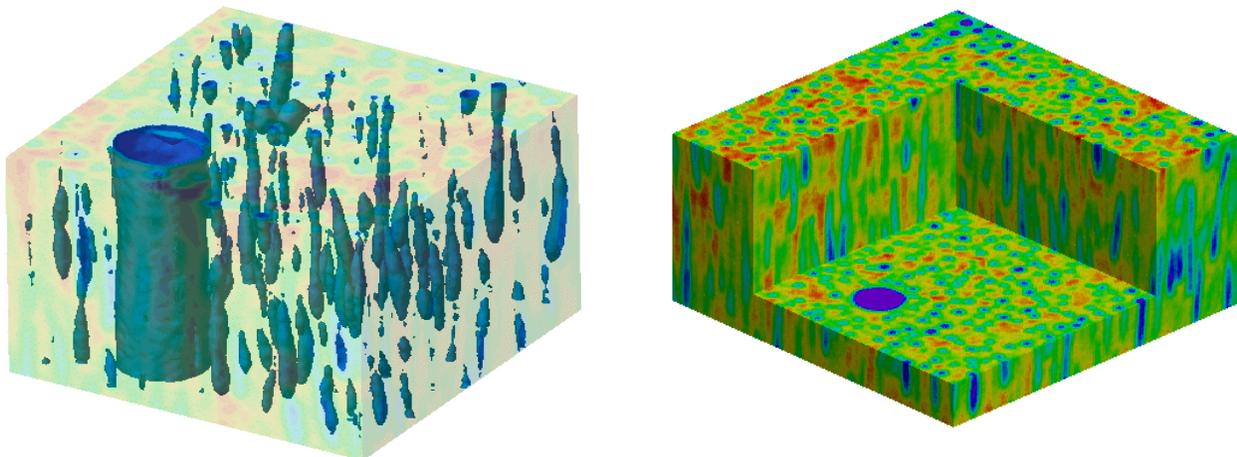
<http://mstd.nrl.navy.mil>

Science and Technology Success Stories

Materials Characterization Using X-Ray Computed Tomography

The Naval Research Laboratory (NRL), the Navy's corporate laboratory, has a program in characterizing advanced materials using synchrotron X-ray computed micro-tomography (XCMT). With collaborators at the National Synchrotron Light Source, XCMT images with resolutions of about 2 microns are achieved. Three-dimensional volumes are created, using 3D FFT (Fast Fourier Transform) volume reconstruction algorithms written for high performance computing platforms. User perceptual interactions may be further enhanced, with the use of NRL's GROTTTO virtual reality system.

The objective of this program is to study the 3D local microstructural interactions in materials. Three-dimensional information about the embedded phase number, size, shape, orientation and distribution in the material are obtained. Images are suitable for converting to finite element models. Thus, 3D finite element modeling and experimental XCMT data can be used to improve material constitutive relations for predicting performance.



XCMT Images of Porous Copper Formed Using GASAR Process

Materials Characterization Using X-ray Computed Tomography

Military Impact

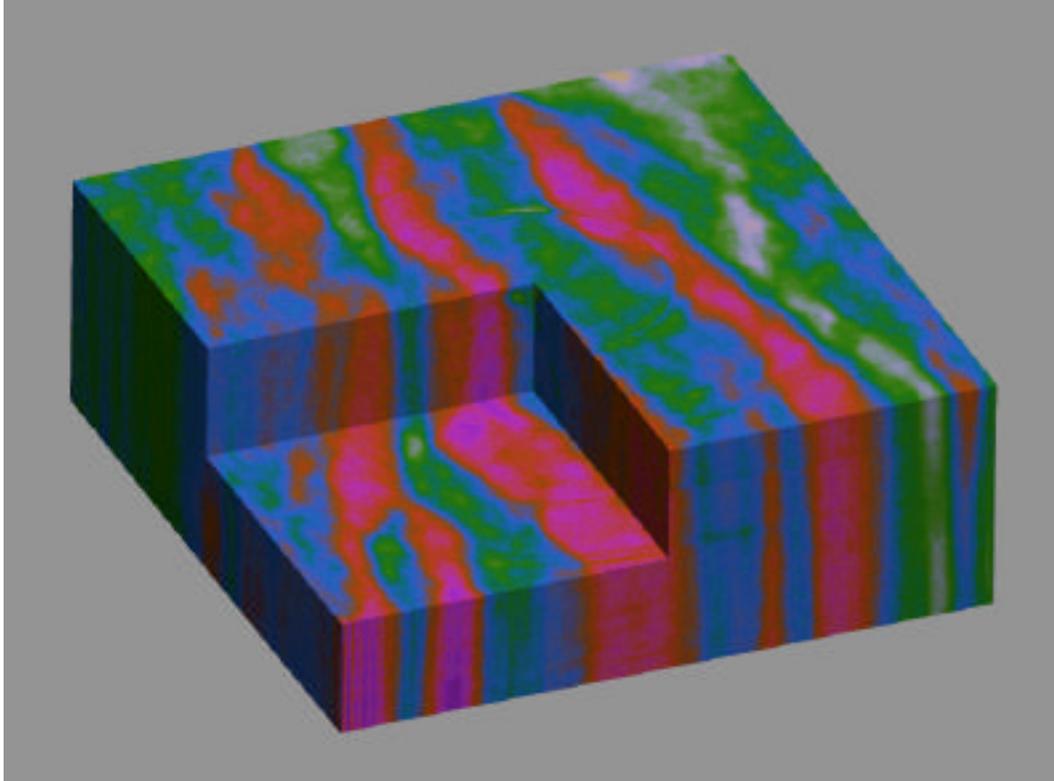
- **Microstructure Characterization:**
 - Porous Metals
 - Composite Materials
- **Materials Manufacturing Reliability :**
 - Composite Materials
 - Low Density Core
- **Failure Analysis in:**
 - Low / High Velocity Impacted Metals & Composites
 - Crack Initiation/Interaction in Porous metals

Potential Civilian Spin-offs

- **Quality Control for:**
 - Lightweight Aircraft Structures
 - Automotive Structures
 - Lightweight Building Materials

Point of Contact

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XCMT Image of a Continuous Fiber Ceramic Matrix Composite with Tailored Reinforcement (Green) and Matrix (Red) Distributions