Inn and Conference Center for the University of Maryland University College, College Park, MD

1:00~5:30, June 6, 2004 (Sunday)

Neutron Scattering Tutorial on:
Introduction to Neutron Diffraction Studies of Residual Stress and Mechanical Behaviors

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1:00~1:10 Welcome (10')

1:10~2:00 Introduction to Neutron Diffraction by Dr. Tom Holden (50')

Topics:

(1) Diffraction
(2) Braggs Law
(3) Cross-sections for diffraction
(4) Penetration into materials
(5) Diffractometers at reactors and spallation sources
(6) Fluxes at reactors and spallation sources
(7) Concept of stress-scanning
(8) Why we do tensile testing
(9) Typical analyses and some problem areas (d0, big grain, near surface)

2:00-2:15 Q/A and Break (15')

2:15-3:05 Strain Measurements at Reactor Sources by Dr. Ron Rogge (50')

Topics:

(1) Geometry and operation of continuous-source instruments
(2) Advantages and disadvantages of continuous-source instruments
(3) Case studies: industrial and academic
(4) Beyond stress/strain
(5) Summary

3:05-3:20 Q/A and Break (15')

3:20-4:10 Structural Materials Science at a Time-of-Flight Neutron Source by Dr. Don Brown (50')

Topics:

(1) Brief description of neutron moderation and incident spectrum.
(2) TOF diffractometers: High Intensity vs. High Resolution.
(3) Advantages and disadvantages of TOF method.
(4) Discussion of polycrystalline plasticity and what it implies for lattice response to stress/temperature.
(5) Examples of in-situ neutron diffraction studies:
    a. In-situ loading of isotropic materials, anisotropic materials, and composites : development of strain and texture.
    b. In-situ creep measurements.
    c. In-situ reaction/aging measurements.
(6) Strain scanning on a TOF instrument.

4:10-4:25 Q/A and Break (15')

4:25-5:15 Theoretical Modeling by Dr. Mark Daymond (50')

Topics:

(1) Finite element modeling - an introduction to what it is and how it works
(2) FEM - modeling of macroscopic scale stress fields, some examples, future challenges and directions
(3) FEM - modeling of polycrystalline plasticity, how to do it and some examples
(4) Self-consistent modeling - an introduction to what it is.
(5) Eshelby modeling of composites, with examples
(6) EPSC modeling of strain development in metals, with examples
(7) VPSC modeling of texture development in metals, with examples
(8) Future challenges and directions in modeling of plasticity
(9) Modeling of instruments (very brief on Monte Carlo, a little more on using software to help with experimental planning)

5:15-5:30 Q/A and Break (15')

5:30 Adjourn