Crystallography School 2018

Organized by the Interdepartmental Centre for Crystallography (CrisDi)

Torino 28 May - 15 June 2018

BASIC COURSES 28 May - 1 June 2018

Prof. P. Benna

BC1: Introduction to Crystallography (1½ CFU)

Crystalline State. Elements of symmetry. Point and spatial groups (examples). Direct and reciprocal lattice. International tables.

Dr. A. Agostino

BC2: Instrumentation for X-Ray Diffraction (1 CFU)

X-Rays sources. Filters and monochromator crystals. Detectors. Geometries.

Dr. R. Cossio

BC3: Electron Diffraction (1 CFU)

Electron sources: conventional and FEG. Magnetic lenses, aberrations and resolution of the electron beam: TEM, STEM, SEM. Types of electron diffraction: SAED, CBED, EBSD. Geometry, detectors and new instrumental developments.

Prof. A. Pavese

BC4: X-Ray Diffraction (1 CFU)

X-Rays interaction with matter. Kinematic theory. Ewald, Laue, Bragg. Atomic scattering factor. Structure factor and diffracted intensity. The temperature factor.

Prof. M. Milanesio

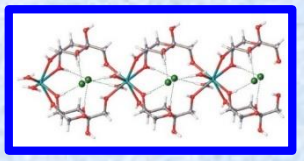
BC5: X-Ray Diffraction Methods: Polycrystalline (2½ CFU)

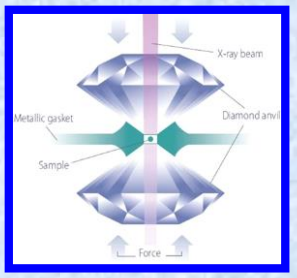
Powder diffraction: Principles. Experimental design. Sample preparation. Main instrumental aberrations. Peak profile function. Data analysis: Qualitative analysis. Data reduction. Quantitative analysis.

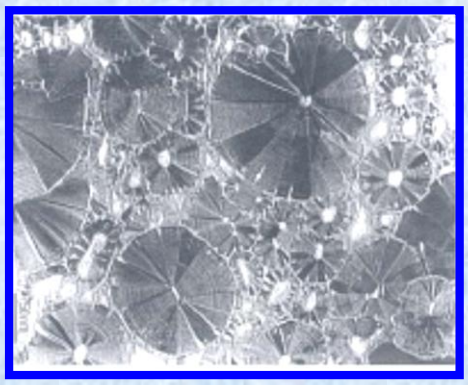
Dr. D. Marabello

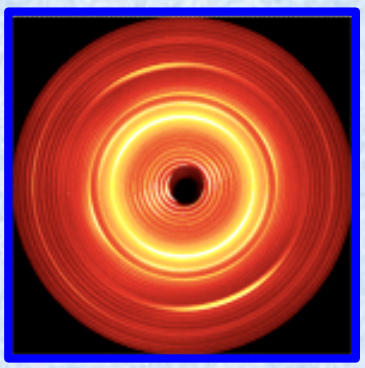
BC6: X-Ray Diffraction Methods: Single Crystal (2½ CFU)

Definition and selection of crystals. Instrumentation. Determination of cell parameters. Data collection. Structure resolution and refinement. Critical evaluation of the results. *LAB - PART I*: Visit to the instrumental laboratory. *LAB - PART II*: Practice on structure resolution in a computer laboratory.









SPECIALIZED COURSES

4-8 June 2018

Prof. G. Di Nardo

SC1: Structural Study of Biological Macromolecules (2 CFU)

Protein crystallization: requirements and strategies. Sample preparation. Protein crystallization methods and phase diagram. Screening of crystallization conditions. Optimization of protein crystals: seeding and additional screening. Co-crystalliza-tion with ligands: soaking. Protein X-Rays diffraction: Cryoprotectants and crystals preparation. Sample mounting. Structural solving methods: Molecular replacement. Anomalous diffraction and isomorphous replacement.

Prof. F. Cámara

SC2: In situ non-ambient conditions by Single-Crystal XR Diffraction (2 CFU)

High Temperature: Heating devices, mounting of the crystal and temperature calibration. Effects of temperature. Cell parameters and thermal expansion. Structures. High Pressure: Background & technical problems. Cell parameters & equations of state EoS . Structures. Examples of distortive phase transitions studied by in-situ SCXRD: Expansion of Landau.

Prof. A. Ferrari

SC3: Solid State Properties: Modelization (2 CFU)

Introduction to the "CRYSTAL09" code. Dielectric and electronic properties in solids. Fundamental equations. Simulation of XRD spectra. Study cases.

Dr. E. Costa

SC4: Introduction to Crystal Growth (1½ CFU)

Basic of growth mechanism: Nucleation processes. Heterogeneous and homogeneous nucleation. Growth of a crystal. Equilibrium shape. Interface and roughening. Growth technologies: Main growth mechanism. Melt grown. Solution grown. Floating zone growth. Other methods. Characterization of crystals: Crystal defects. Twins. Crystal surfaces. Inclusions and precipitates. Selected method of characterization. Etching. X-ray topography. Optical microscopy. SEM. TEM.

Dr. N. Curetti

SC5: Practical course for HP in situ Experiment - Diamond Anvil Cell (1 CFU)

DAC cell: components and assembly for HP experiment. Use of the standard-crystals for monitoring the internal P. Application of the DAC in XRD experiment.

Dr. F. Bertolotti

SC6: The Debye Scattering Equation: a Total Scattering approach for characterizing Nanomaterials (1 CFU)

Fundamentals of Debye Scattering Equation (DSE). Data collection and reduction for total scattering experiments. Characterization of structure, microstructure and morphology of nanocrystals through the DSE. DSE applications. The DebUsSy program suite: an overview. Tutorial session on the DebUsSy program suite.

11-15 June 2018

Dr. A. Agostino

SC7: The Rietveld Method (2 CFU)

Basic theory. Problems with the Rietveld method: Indexing. Peak-shape function (PSF). Background. Preferred orientation and texture.

Prof. R. Arletti

SC8: Inorganic Crystallochemistry (1 CFU)

Basis of the Crystallochemistry. Compact Packing of Sphere. Coordination Polyhedra. Crystalline Structure: examples. Polymorphism and Isomorphism: examples. Different kind of Silicates: Chain, Layered, Framework. Zeolites: structural features and properties.

Prof. E. Belluso - Dr. S. Capella

SC9: Use of TEM-EDS for the characterization of Natural or Synthetic sub-micrometric Inorganic Phases (2 CFU)

Sample preparation. Data acquisition: Morphology. Electron diffraction. Semi-quantitative composition. Structure. Refinement of acquired data.

Prof. R. Giustetto

SC10: Causes of Colour in Minerals (2 CFU)

Crystal Field Theory (in octahedron and tetrahedron); Jahn-Teller Effect. Intervalence charge transitions, transitions between valence orbitals and conduction band. Colour Centres; artificial procedures to colour minerals and gems. Iridescence, Luminescence and Fluorescence.

Prof. R. Arletti

SC11: In situ/operando X-Ray Powder Diffraction (1 CFU)

High pressure X-Ray powder diffraction (cell, geometries, conventional and non conventional sources). High temperature XR powder diffraction. In situ/in operando X-Ray powder diffraction on porous materials: experiments and data analysis.

Prof. M. Dapiaggi

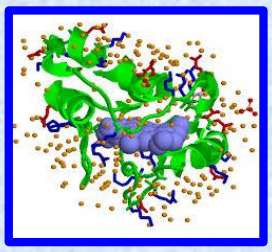
SC12: Pair Distribution Function Analysis of Complex, Disorder and Amorphous Materials from Total Scattering Data (1 CFU)

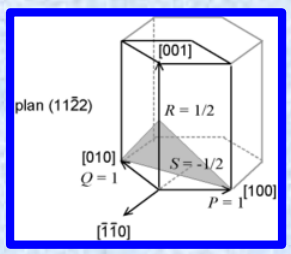
Total scattering data: why? How to evaluate the structure-properties relationship of complex and disorder material. Basic theoretical needs and experimental setup. Amorphous 'on the go'... very short range order. How to obtain a PDF and how to refine it to a model (practical).

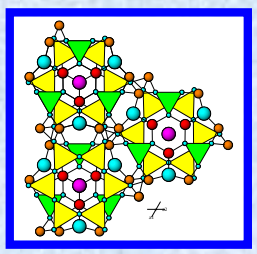
Dr. L. Pastero

SC13: Crystal growth for beginners (1CFU)

Ideal crystal vs real crystal. How to nucleate, grow and modify crystals in lab. Surfaces and interfaces. Surface analysis by SPM technique.s







The final program and forms for registration are published in **www.CrisDi.unito.it**.
For any further information please refer to **piera.benna@unito.it.**