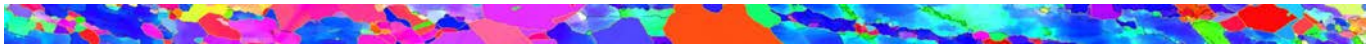
QUANTITATIVE TEXTURE ANALYSIS AND ELECTRON BACKSCATTERED DIFFRACTION (EBSD) APPLICATIONS



OVERVIEW

Most crystalline materials are composed of small crystals called crystallites or grains. The spatial organization of the crystals defines the microstructure of the material. Individual crystals of many metals, ceramics, minerals or even bio-matter (e.g., wood, bone, shells, etc.) have anisotropic mechanical and physical properties. Indeed an individual crystal may be locally bent or distorted in an aggregate due to the compatibility constraints or previous history, and notion of orientation is applied to all scales from aggregate to atomic scale. 'Texture' in the widest meaning of the word, incorporates the crystal-preferred orientation of crystals and the microstructure of polycrystalline material. The degree of crystal preferred orientation (CPO) controls to first order the anisotropy of the material, being isotropic for uniform orientation and close to the single crystal anisotropy for a very strong preferred orientation. The arrangement of the crystals and their shape will also have some influence of the material properties. Texture and the associated anisotropic mechanical and physical properties have a wide range of applications in research and industry, which requires well-trained personnel in this area to stimulate technological innovation and undertake cutting edge research. Classical examples of the influence of texture on mechanical properties stem from metallurgy where Young's modulus, plastic yield strength and formability (e.g., deep drawing) depend on texture. In geological materials composed typically of low symmetry minerals anisotropy is frequently very strong and manifests itself on a global scale as the anisotropy of seismic wave speeds from the surface to the inner core. In last few decades, Electron Backscattered Diffraction (EBSD) analysis appeared to be one of the major applications in determining, visualizing and interpreting deformation induced textures of crystalline materials. The technique involves understanding the structure, crystal orientation and phase of materials in the Scanning Electron Microscope (SEM).

A significant volume of data processing and interpretation is essential for EBSD aided texture analysis. The live and post-mortem data analysis involve new algorithms using increasingly sophisticated mathematical methods are continuously being developed by the academic community. Commercial software has all the attributes of modern interactive interface; it does not always have a transparent guide to mathematical and numerical methods, which have been applied to the data. The newly developed MTEX open source MATLAB toolbox provides a software that is vital for research, development and teaching using a commonly used computer environment (MATLAB) in teaching.

For sophisticated textural and microstructural analysis it is therefore important to expose our students and young researchers to all such newly developing techniques and encourage them to employ in their research applications.

OBJECTIVES

This course is designed to present a theoretical understanding and practical training in an area traditionally called "Quantitative Texture Analysis". The participants will learn a unique mathematical approach to analyse integral X-ray, neutron or synchrotron diffraction pole intensity data as well as individual orientation data from Electron Backscatter Diffraction (EBSD) with hours of hands-on exercises applying free and open MATLAB toolbox MTEX for texture analysis. In particular, estimation of an orientation distribution function (ODF) and its properties as harmonic coefficients, volume portions, texture index, entropy, calculation of anisotropic properties etc. from the different kinds of data and grain reconstruction from EBSD data will be included.

Modules	1st - 8th, November, 2018, IIT Kanpur Number of Participants for the course will be limited to 30
You should attend if ...	Researchers from academia, government organizations including R&D laboratories with a background in Earth Sciences, Physics, Material Sciences, Metallurgical and Mechanical Engineering. Graduate and Postgraduate students (B.Sc. / B.Tech. / M.Sc. / M.Tech. / PhD), Post-doctoral fellows and faculty from reputed academic institutions and technical institutions.
Fees	The participation fee for taking the course is as follows: Participants from abroad : USD 500 Industry/ Research Organizations : INR 8000 Faculty from Academic Institutions : INR 5000 Indian Students : INR 1500 The above fees include all instructional materials, computes for tutorials, laboratory charges and internet facility. The participants will be provided with twin sharing accommodation on payment basis at IITK.

THE FACULTY

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