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FACULTY DEVELOPMENT PROGRAM
ORGANISED BY
DEPARTMENTS OF CHEMISTRY, PHYSICS AND MATHEMATICS

Introduction to Powder X-ray Diffraction and its Applications in Materials Science

The Department of Basic Science, MVJCE, has organised a Faculty Development Program (FDP) from 25th March 2025 to 27th March 2025 at Seminar Hall 1, MVJ College of Engineering. The Faculty Development Program (FDP) aimed to provide an in-depth understanding of advanced materials characterisation techniques. The program sought to enhance the participants' knowledge of the latest tools and methodologies used in material analysis and to facilitate the application of these techniques in both academic and research settings. The program featured interactive sessions and technical discussions led by the esteemed resource person from premier institutes. The details of the forenoon session are as follows.

Date of the Event	27.03.2025
Title of the Event	Introduction to Powder X-ray Diffraction and its Applications in Materials Science
Guest Speaker	Dr. C. Shivakumara, Principal Research Scientist, Solid State and Structural Chemistry Unit, Indian Institute of Science (IISc), Bangalore
Organized by (Department name)	Department of Physics, Chemistry and Mathematics
Name of Department event coordinators	Dr. Bharath.D (Assistant Professor and HOD, Department of Physics)

Dr. Preethi, HoD, Department of Chemistry, welcomed the Chief guest, and Prof.Swati Lal, Department of Chemistry, introduced the Chief guest to the audience. The session was concluded with a vote of thanks by Dr.Swetha from the Chemistry Department.

The lecture on "Introduction to Powder X-ray Diffraction (PXRD) and its Applications in Materials Science" was delivered by Dr. C. Shivakumara, a Principal Research Scientist at the Solid State and Structural Chemistry Unit of the Indian Institute of Science (IISc), as part of a Faculty Development Program (FDP) organized by MVJ College of Engineering (MVJCE) on 27th March 2025. Dr. Shivakumara provided an in-depth understanding of the principles and applications of powder X-ray diffraction in materials science.

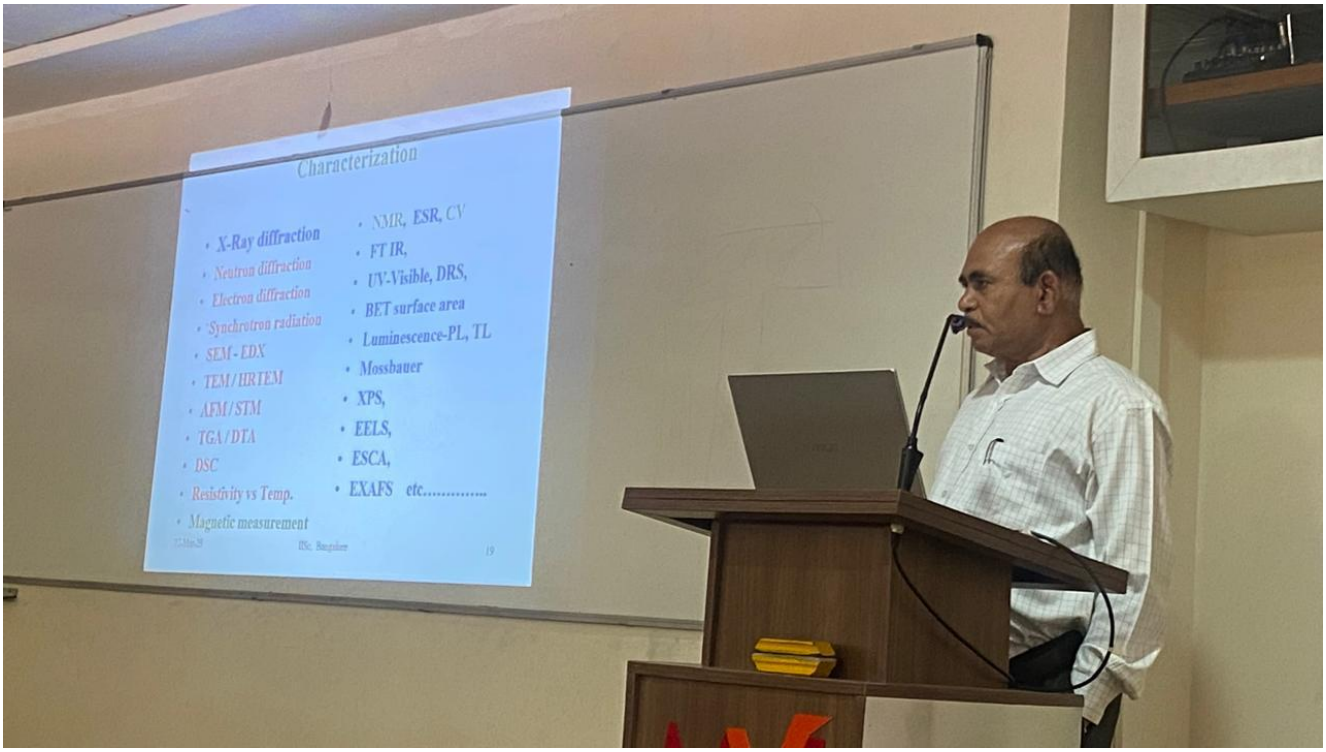

Figure 1: On the dais: Dr. C. Shivakumara, Principal Research Scientist, Solid State and Structural Chemistry Unit, Indian Institute of Science (IISc), Bangalore

Dr. Shivakumara began the session with a brief overview of X-ray diffraction (XRD), explaining its significance as a non-destructive technique used for characterising the crystallographic structure of materials. He emphasised the role of PXRD in studying polycrystalline materials and how they differ from single-crystal X-ray diffraction. The main points covered in this section included: Principles of X-ray Diffraction, Powder X-ray Diffraction, Bragg's Law, Techniques and Instrumentation in PXRD and Applications of PXRD in Materials Science.

Dr. Shivakumara also touched upon recent advancements in PXRD technology, such as developing synchrotron X-ray sources, which provide higher resolution and faster data collection. He also discussed the challenges in PXRD, including peak overlap, sample texture, and low sensitivity for amorphous materials. He mentioned some emerging computational techniques, such as Rietveld refinement, that aid in the analysis of complex diffraction data and improve the accuracy of structural determinations.

Outcome of the event:

The session was highly informative, providing a strong foundation in powder X-ray diffraction's theoretical and practical aspects. It made it an essential learning experience for those involved in materials science research.