INTRODUCTION

As an independent scientific discipline, crystallography did not secure its position in Turkey until the 1960's. In general crystal geometry and crystal optics were taught in Geology and Mineralogy Departments in the form of general and special mineralogy to prepare students for microscopic investigation of the crystalline material. In some departments, as well as in the Mineral Research and Exploration Institute of Turkey (MTA), few x-ray powder diffractometers existed for identification of an unknown. In physics and chemistry departments the subject of crystal symmetry, physical and chemical properties of crystals were taught without going much into detail of structure analysis.

In the mid 1960's Ali Fuat Cesur of Ankara University started an X-ray crystallography laboratory, which used photographic single crystal data collection techniques. In 1970 a new laboratory for structural research was established at Hacettepe University in Ankara under the leadership of Dincer Ulku. The initial equipment involved a 5kW x-ray generator for dual tube operation, a GE-SPG2 Spectrogoniometer with a quarter circle single crystal orienter, proportional and scintillation counters as well as Wiessenberg, Buerger Precession and powder cameras. Since then, this laboratory has become the leading centre of X-ray crystallography in the country. In 1992 the purchase of a CAD-4 diffractometer improved data collection and publications in internationally refereed journals and attracted many young scientists to do their graduate work in x-ray crystallography. In 1999 a rotating anode X-ray generator was put in operation in the same department. X-ray crystallographers trained at Hacettepe University were offered academic positions at other universities in the country. For instance, the crystallography laboratories at Gazi, Erciyes, Ondokuzmayıs and Atatürk Universities were established by these young crystallographers and are very active, especially in chemical crystallography today. Several X-ray single crystal and powder diffraction units currently exist scattered across the country.

However, there are some university X-ray diffraction labs in the country, mainly dedicated to materials science research using crystallographic methods.

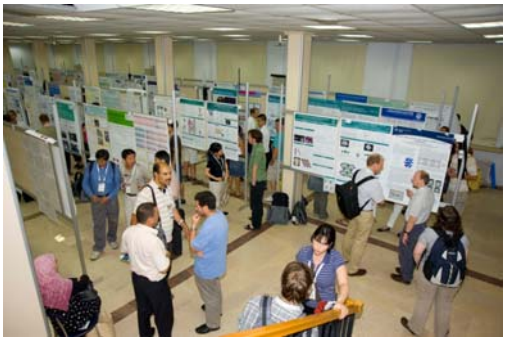
The SESAME (Synchrotron Light for Experimental Science and Applications in the Middle East) Project will promote the crystallographic studies in Turkey. It is being developed under the umbrella of UNESCO. Jordan was selected as the building site. SESAME will be a 2.5GeV 3rd Generation light source, providing excellent performance for structural molecular biology, molecular environmental science, surface and interface science, microelectromechanical devices, x-ray imaging, archaeological microanalysis, and materials characterization. The founding members are Bahrain, Cyprus, Egypt, Iran, Israel, Jordan, Pakistan, Palestine Authority and Turkey. Turkey will be involved in building of the Protein Crystallography and the Powder Diffraction beamlines. Young Turkish Scientists along with the other SESAME member country scientists have benefited greatly from offers by other light source facilities including training fellowships in both accelerator technology and applications of synchrotron radiation. Some of them have spent periods of several weeks up to two years at different European, US and Taiwan Light Source laboratories. For more information: www.sesame.org.jo.

Turkish Crystallographic Association (TCA)

In 2001 formed Turkish Crystallographic Association (TCA) presently has about 140 registered members, one fourth of whose are senior scientists (www.tucr.org).
The European Crystallographic Association welcomed the Turkish Crystallographic Association at its General Assembly in Cracow in August 2001 as a new member. TCA organizes National Meetings biennial and workshops on different areas of crystallography. Profs W. Duax, J. Glusker, G. Cascarano and P.Rizkallah had been attended to the 2006 National Meeting

held in Kayseri. 25th European Crystallographic Meeting was organized in Istanbul in 2009 by TCA. Turkish Crystallographers are very proud of to organize the Congress with a great success (IUCr Newsletter, Volume 18, Number 1, 2010).

The participants of the 2nd National Meeting in Kayseri.



Photos from the ECM25 Istanbul Meeting

Hacettepe University, Ankara

The Hacettepe University is located in Ankara, capital of Turkey. The Crystallography and X-ray groups are involved in the following research activities.

Crystallography Laboratory

- Structure of organic and inorganic small molecules such as polynuclear coordination complexes of transition metals with unusual magnetic properties, inclusion compounds such as Hoffmann Clathrates and crown ethers, phosphazene derivatives, intermetallic compounds, and synthetic metallic materials…
- Structure determination, structure-activity relationships and DFT calculations of pharmaceutic compounds such as flavones, oxime ether derivatives, indoles, benzimidazoles, triazole and thiosemicarbazones…
- Protein crystallography studies have been started in the lab. The plant lectins from daffodil and lentil had been studied at Daresbury Laboratory, UK in collaboration with Dr. P. Rizkallah. The structures of the neurotoxic peptides purified from Turkish Scorpions have been working with the collaboration Prof. J.R. Helliwell from Manchester University (sozbey@hacettepe.edu.tr).

- The first small and wide angle x-ray scattering (Hecus SWAXS) system in Turkey was installed at the same laboratory in 2009. Recent studies on SWAXS analysis of multicompartment micelles formed by the newly designed ion pair hybrid surfactant, topical lamellar liquid crystals, hydrogels, polymer coated magnetic nanoparticles, stimuli-responsive block copolymers, marble dust and wood nanocompozites, drugs and membrane interactions as well as on biological samples such as teeth and spider silks continue (side@hacettepe.edu.tr).

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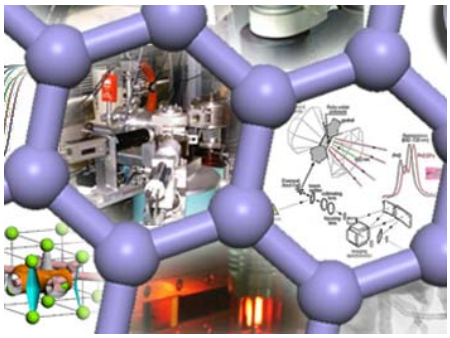
Advanced Materials Research Group

The scientific activities of the Advanced Materials Research Group includes the following four major research areas: Intercalation compounds, Graphite-like compounds, Nanocarbon, and High-Pressure and Superconducting Materials. Materials science research at AMRG is focused to improve our understanding on the relationships between structural and material properties using powder, high-pressure and electron crystallography, and developing new synthesis and characterization techniques for advanced materials. The group has also responsibility for the powder diffraction beamline at SESAME.



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Ankara University, Ankara

Material Research Laboratory

The group has an intense collaboration with research centers in Germany. The group is interested in X-ray single and powder crystal diffraction, electrical, magnetic and specific heat properties depending on temperatures, electrical and magnetic fields of mono and hetereo crystals and rare earth alloys.
Production, physical and magnetic characterization of rare earth-intermetalic magnetic compounds between 2K- 350K. Magnetocaloric materials, hard and soft magnetic materials, magnetic sensor materials, nanomagnetism.

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Nonlinear Optics Laboratory

This group is established in 2005 and equipped with the Spectra Physics Femtosecond Laser System, Light Conversion Topas-C Optic Parametric Amplifier, Newport Helios Spectroscopy System, Quantel Briallant Nanosaniye Laser System, J.A Woolaam M2000V Spectroscopic Elipsometer.
Measurements of the second and third NLO Properties and also optical limiting behavior of organic thin films, carbon nanotubes, polymers, organic and organometallic compounds.

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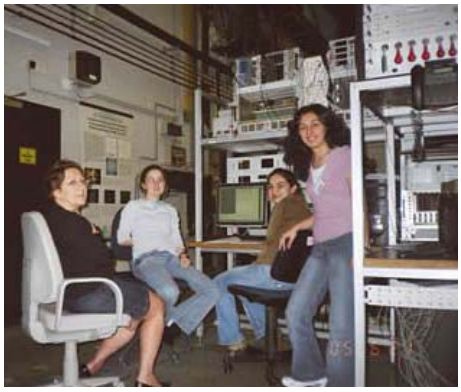
Sabancı University, İstanbul

Molecular Biology Research Laboratory



- Research focuses on probing the relationship of the 3D structure to function in biological macromolecules. These studies provide clues to mechanisms of fundamental processes in living organisms, help to predict function from 3D structure and give insights for engineering new systems.

- The areas of specialization include molecular biology and cloning, protein isolation and characterization and 3D structure determination using synchrotron X-ray solution scattering and diffraction techniques. The current projects applications could range from designing new systems for environmental pollution remediation to pathogen resistance in plants.

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Ondokuz Mayis University, Samsun

The research activities have rapidly been increased by having the IPDS II diffractometer with a low temperature apparatus in the physics department of Ondokuz Mayis University. The diffractometer is being served to fifteen academic staff together with number of M.Sc and PhD students. The academic staff in the department also welcomes to cooperate with the researchers in different area of science. The crystallography studies at OMU are mainly involved in the following research activities;

- Study of organic crystals with non-linear optical properties
- Determination of the structure of novel saccharine and acesulfame metal complexes and their biological activities
- Structural and magnetic properties of dimmeric cyano complexes
- Supramolecular structures and crystal engineering.

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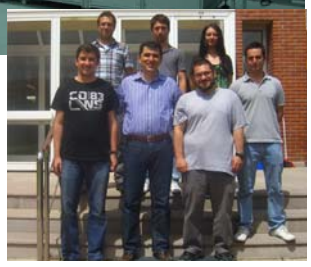
Anadolu University, Eskişehir

Advanced Thin Film Research Group



- This group is established in 2008 at Department of Material Sciences and Engineering. Main research areas are spintronic (Spin Valves and Tunnel Magneto Resistance) and Photovoltaic (wide band gap semiconductors, complex metal oxide thin films). A self-designed multi-chamber sputtering tool with magnetic annealing oven is used for production of nanoscale/ultra thin film systems containing metal, semiconductor and insulator materials.
- Facilities for structural characterizations of thin films are: One X-Ray Diffraction Tool for Grazing Incidence X-Ray Diffraction, X-Ray Reflectivity and Rocking Curve measurements and one Scanning Probe Microscope (AFM, STM, LFM). Pictures of multi-chamber thin film deposition system and group members are given below.

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Middle East Technical University, ANKARA

Chemistry Department

- Chiral synthesis of amino acids, drugs, biologically active compounds, biodegradable polymers, characterization and synthesis of natural products.
- Application of quantum chemical methods to spectroscopic studies, metal clusters and colloids.
- Measurement and control of hazardous substances in various environment
- Application and development of nuclear analytical, atomic spectroscopic and chromatographic techniques for pollution studies and for analysis of trace elements in biological materials
- Low energy atom diffraction (LEAD), X-ray Diffraction, X-ray photoelectron diffraction, scanning probe microscopy and quartz crystal microbalance studies of self assembled monolayers (SAMs) and organic semiconductor thin films.

Central Laboratory:

Rigaku Ultima IV X-ray diffraction system, service crystallography.

Erciyes University, Kayseri

In the X-Ray Research Laboratory, there exist an Enraf-Nonius Diffractis 583 X-ray generator, Weissenberg and Buerger Precession cameras, and one microdensitometer. In addition, the University of Technology Research Center has a Bruker AXS D8 Advance X-ray powder diffractometer and a LEO 440 scanning electron microscope.

Group members generally study to elucidate the molecular and crystal structures of the organic and metal organic compounds with medical and pharmacological properties by single-crystal X-ray diffraction method. Furthermore, quantum mechanical calculations of molecules and by using X-ray powder diffraction method, identification of the phases of the crystalline substances and determination of the structural parameters are also made.

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Kırıkkale University, Kırıkkale

X-ray Crystallography Laboratory

Full circle Single Crystal X-ray Diffractometer Rigaku Msc/Afc-7s and a TEM was purchased in 1998. Structural researches include single crystals of boron complexes obtained from acidic amines, amides and organics, investigations of Al and Cu based microstructures, metallic borons, and small molecule single crystals.

Dokuzeylül University, İzmir

X-ray Crystallography Laboratory

Muhittin Aygün and his coworkers have been interested in chemical and mathematical crystallography since 2003. In chemical crystallography, the main research interests of the group are focused on molecular structure, crystal structure

and intermolecular interactions of N-Heterocyclic Carbene (NHC) complexes with transition metals. Another research interest of the group is about the theoretical foundations of classical crystallography (CCr) and quantum crystallography (QCr).
Researchers at the Dokuz Eylül University have improved the solution of the phase problem in conventional crystallography by putting forward a new methodology called as Generalized Classical Crystallography (GCCr). The well-known tangent formula was revised in terms of perturbative contributions from various orders with the aid of information theory and generalized polynomial equation satisfied by electron density in the unit cell. From generalized point of view, conventional crystallography which is still prevalently used to solve crystal structures is, in fact, zeroth order crystallography and higher order crystallographic studies are possible. In addition, a novel iterative scheme was developed for the application of Generalized Quantum Classical Crystallography (GQCr).

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İstanbul University, İstanbul

Laboratory for Advanced Analysis

Crystallography studies in İstanbul started in 2003 after Advanced Analysis Laboratory established in the Istanbul University. In the same year the single crystal X-ray diffractometer (Rigaku R-AXIS Rapid-S) and the X-ray powder diffractometer (Rigaku D-Max family) were installed in Advanced Analysis Laboratory.

Structural studies of newly synthesized organic and inorganic molecules, phase analysis of functional materials and clays.

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Atatürk University, Erzurum

Small molecule crystallography laboratory in Ataturk University was founded in 2005 in organic chemistry division. In this section, the synthesis of natural products, synthetic organic chemistry studies, asymmetric synthesis and mechanistic studies are performed. To create the structure of the synthesized products, as well as other spectroscopic methods, certain structures and configurations are determined by using small molecule X-ray crystallography. Together with other organic and inorganic compounds of working groups an average of 40-50 structures per year converted into the publications (Tetrahedron: Asymmetry 17 (2006) 2625–2631, J Inorg Organomet Polym (2010) 20:334–342, Bioorganic & Medicinal Chemistry 18 (2010) 4468–4474, Tetrahedron 66 (2010) 3485–3489).

Balıkesir University, Balıkesir

Our research group works on the investigation of the crystal structure and the magnetic properties of novel polynuclear Schiff base transition metal complexes which show interesting magnetic properties. These materials which show magnetic properties have very important technological applications as the storage of information at the molecular and nanoscale level. The development and diversification of these new technologies and their application areas will depend on the development of the new materials that show magnetic properties. We are planning to develop new magnetic materials which show interesting magnetic properties such as single molecule magnet and search for their technological applications.

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Other Institutions have diffraction facilities

Some of the Labs in which X-ray diffraction facilities exist as research infrastructure of Applied Physics and Material Science Departments are located at the following institutions:

- Middle East Technical University, Metallurgical & Materials Department and Central Research Laboratory
- Osmangazi University, Eskişehir
- Gazi University, Semiconducter Tech.Adv. Research Laboratory
- Harran University, Urfa
- İzmir Institute of Technology, Materials Research Centre, İzmir

There are many industrial institutions in Turkey including labs that do powder diffraction for materials characterization and quality control such as Turkish Atomic Energy Agency, General Directorate of Mineral Research and Exploration, General Directorate of Highways, General Directorate of State Hydraulic Works.....