
Isfahan
University of
Technology
Department of
Chemistry

What is Chemistry?

Chemistry is an important branch of science that involves the professional study of the composition, structure, and properties of organic and inorganic substances. Two famous slogans coined by chemists “Is there anything in life which does not involve chemistry?” and “What in the world isn’t chemistry?” Chemistry plays an integral role in today's scientific endeavors.

In The Name of God

Contents

Overview

The Department of Science of Isfahan University of Technology (IUT), consisted of three educational groups, including chemistry, physics, and mathematics, started its official activities in October 1974. In 1984, the chemistry group started its activities as "Department of Chemistry" and began accepting undergraduate students (B.Sc) in pure and applied chemistry. In September 1988 and October 1995, the M.Sc. and Ph.D. programs were officially established in the Department of Chemistry. The M.Sc. programs in several fields, including Physical Chemistry, Analytical Chemistry, Organic Chemistry, Inorganic Chemistry, nanochemistry, and applied chemistry, are offered. In the Ph.D. program, the students may work on any area of their interest in the above-mentioned fields. Now, twenty-six faculty members including fourteen Professors, nine Associate Professors, and three Assistant Professors are active in the Department. The department of chemistry is the research pole in the fields, including medicinal chemistry, sensor, catalyst, and nanochemistry in our country (Iran). Our chemistry graduate and undergraduate students are extensively engaged in research with faculty members. Research is underway in many exciting areas in chemistry, notably cutting-edge works. Now, 150 undergraduate and more than 350 graduate students are learning and reasearching in the Department. About 20% of university's annual published articles of IUT are related to the Department of Chemistry.

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Department of Chemistry

Degree Programs

B.Sc.

The aim of the undergraduate program (B.Sc.) is to enable students of pursuing either professional careers in industry and chemical education or advanced graduate studies. Our undergraduate students must take 20 credit hours in general courses, 26 credit hours in basic science courses, 71 credit hours in core courses, and 15 credit hours in elective courses (132 credits in total) to be qualified for the degree of B.Sc. in chemistry. A good set of lecture courses in general areas of chemistry, including analytical, inorganic, organic, and physical chemistry, and more specialized courses in the field of organic synthesis, environmental chemistry, nuclear chemistry, biochemistry, molecular spectroscopy, and industrial electrochemistry, have been provided. Recently, a new elective course entitled “advanced topics in chemistry” has been provided for the undergraduate students, which is presented each semester within one field of chemistry (analytical, organic, physical, or inorganic chemistry). The undergraduate students who take this course are introduced to current research topics and realize the importance of chemistry in

M.Sc.

Our Master of Science (M.Sc.) program provides the research-oriented training and education necessary for students entering the doctoral programs in chemistry or for training professional chemists qualified to function in technical and industrial positions. Our department offers two programs for achieving the M.Sc. degree. The first program is a non-thesis program suitable for those who may already have extensive research experience, for educators who seek to upgrade their academic skills but do not require research experience, or for those who need to broaden their chemical background. For the non-thesis program, the thesis is replaced by a comprehensive review of a subject in chemistry under the supervision of a faculty member. The second program is a traditional apprenticeship in research leading to a written thesis. The students admitted to the thesis program have to be accepted into an individual lab. Starting with a common core, both the non-thesis and thesis options may be developed into a final degree program in any of the six broad areas in chemistry: 1) Analytical Chemistry, 2) Inorganic Chemistry, 3) Physical Chemistry, 4) Organic Chemistry, 5) Nanochemistry, and 6) Applied Chemistry. The students and their supervisors must work together to develop a research plan. A thesis embodying the results of original research shall be submitted to and be approved by the department of chemistry and the IUT Graduate Studies. A written thesis together with an oral presentation is required for the final approval. Graduate students must take a total of 30 graduate credit hours to qualify for the M.Sc. degree. Three of four courses including advanced organic chemistry, advanced inorganic chemistry, advanced physical chemistry, and advanced analytical chemistry should be taken in the first semester. One of these courses should be in the field of the M.Sc. student. Two courses related to the field of the student should be taken in the second semester and two elective courses should be taken in the third semester. All our M.Sc. students mainly focus on their research work related to their thesis in the fourth semester.

Ph.D.

Our chemistry PhD program at the department of chemistry is designed to develop outstanding scholars for careers in research and teaching at leading universities throughout IRAN and other countries. Our PhD program emphasizes empirical and theoretical approaches to chemical research. Our PhD students are required to integrate basic skills in chemistry with focal studies in an emphasized area. Our PhD students, according to their area of study (Organic, Inorganic, Analytical, and Physical Chemistry), must take 15 graduate credit hours and one seminar (1 credit). They are also required to pass a Standard English Test such as IELTS and TOEFL (or equivalent). After finishing their coursework, the students must pass the comprehensive exam consisting of written and oral components. They will then submit a written dissertation proposal to the director of graduate studies in chemistry and will work on the subject under the supervision of a faculty member (20 credits). To evaluate the student's progress in its research project, two oral presentations of the obtained research results, at intervals of six months, are required. This will be judged by a committee of professors and specialists in the related field.

Reasons to study at this department

The Department of Chemistry at IUT creates an exceptional chance for undergraduate and graduate students thorough fundamental knowledge in all fields of chemistry because of the following reasons:

- All the faculty members and staff are well qualified, cooperative, and hard-working, as well as very friendly with the students. Some of our faculty members are among the TOP 1% World Scientists in the chemistry field based on the ISI Essential Science Indicators Database, the Distinguished Researcher of the year of IRAN, the Distinguished Scientist of the Islamic-Word Countries, the Best Researcher of the year in Isfahan University of Technology (IUT), the Distinguish Researcher of the Year in Isfahan Province, Allameh Tabatabaei Award for Iranian distinguished scientists and researchers.
- Providing a set of oriented lecture courses for undergraduate students leading in general areas of chemistry including analytical, inorganic, organic, and physical chemistry, and more specialized courses introducing undergraduate students with the applied and interdicilli-nary nature of chemistry, current research topics, and the importance of chemistry in today's world.
- Setting up of a central laboratory in the department of chemistry with various modern equipments and special instruments available for undergraduate and graduate students to stablish a comfortable research environment . Also, each faculty member has a known laboratory equipped with the facilities specialized for his/her research field.
- Postdoctoral fellows and graduate students, especially, those working toward Ph.D. degrees, are further sources of scientific information and help to undergraduate students.
- Faculty members are available as academic advisers and hold office hours for a consultation about their courses, projects of their graduate students, chemistry, science, and career opportunities.

- Scientific opportunity for advanced undergraduate students to join a research group in the department of chemistry.
- Scientific level of the faculy and its collaboration with industrial companies have provided exceptional career opportunities for our college graduated students to obtain a job in the industry.
- Scientific collaboration between the department of chemistry and other departments at IUT especially physics, material engineering, textile engineering, agricultural engineering, and natural resourses engineering, to provid a background for interdisciplinary research.
- Interdisiplinary collaboration with Royan Institue which is a research and technology hub at the international level in life science with reference in stem cell science, reproduction, biotechnology, restorative medicine, and effective in promoting community health.
- Faculty members have the opportunity to go to other countries for summer sabbatical leave via various supporting scientific programs. In this regard, several faculty members have international collaboration with the scientific centers and universities of other countries such as China, Germany, Italy, Austria, Sweden, Brazil, and Spain.
- Scientific collaboration with the Abdus Salam international center for theoretical physics (ICTP) located in Italy via joint Ph.D. programs including STEP and TRIL.
- Scientific collaboration with international laboratories including Elettra Synchrotron Light Laboratory in Italy and SESAME in Jordan for the synchrotron-based experiments.

Honors and Awards

- Four faculty members are among the TOP 1% World Scientists in the chemistry field based on the ISI Essential Science Indicators Database.
- Seven faculty members are among the Distinguished Researcher of the year of IRAN.
- Four faculty members are among the Distinguished Scientist of the Islamic-Word Countries.
- Several faculty members are also among the Best Researchers of the year in Isfahan University of Technology (IUT), The Distinguish Researcher of the Year in Isfahan Province, and Allameh Tabatabaei Award for Iranian distinguished scientists and researchers.
- Two faculty members as outstanding chemists of the year in analytical and inorganic chemistry.
- Three faculty members are members of the Iranian Science Elities Federation.
- Two faculty members are among the distinguished technologist of the year in Isfahan Province.
- One faculty member is a member of the scientific advisory committee of Synchrotron-Light for Experimental Science and Application in the Middle East (SESAME) in Jordan.
- Achieving the rank of initiative in the 15th Kharazmi International Festival (one faculty member).
- Achieving the first and third place in fundamental research of the Kharazmi Festival (three faculty members).
- Selection of several faculty members as the senior chemist by the Iranian Chemical Society.
- The department has been selected as the center of green sensors and chemistry of IRAN.
- The first and fifth members of the Chemistry Olympiad at the undergraduate level.
- Department of chemistry is proud to hold several seminars and workshops at the national level with the guest speakers from forign countries.

Program Objectives

The purposes of the designed programs in the department of chemistry at IUT is the following items:

- To make the department of chemistry a thriving center of excellence in teaching and curriculum development in IRAN, cutting-edge research, and popularizing chemistry in the community.
- Preparing graduates who will excel in the industry, graduate programs, universities, and high school teaching through rigorous chemistry classroom, laboratory, and research experience.
- Providing a broad foundation in chemistry that emphasises scientific reasoning and analytical problem solving with a molecular perspective.
- To provide international collaborations for graduate students, faculty mobility, and research cooperation.
- Exposing the undergraduate and graduate students to a breadth of experimental techniques using modern instrumentations.
- Leading the students, especially, the undergraduate students to understand the interdisciplinary nature of chemistry and to integrate the knowledge of other disciplines to a wide variety of chemical problems.
- Teaching students with scientific critical thinking and analytical reasoning abilities needed to identify and solve chemical problems and explore new areas of research.

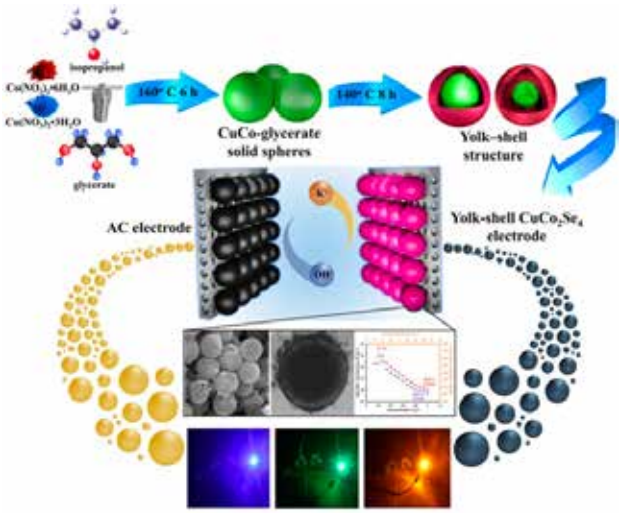
Research Areas

- **Analytical and Bioanalytical Chemistry:**
  Chemometrics, Ion Mobility Spectrometry, Electrospray, Electrochemical Analyses, Chemical and Biochemical Sensors, Separation and Ultra-trace Analysis, Microextraction, Chromatography, Instrumentation and Measurement, Advanced Energy Materials, Solar Cells, Electrosynthesis, Atomic Spectroscopy, and Supercritical Fluid Science and Technology.

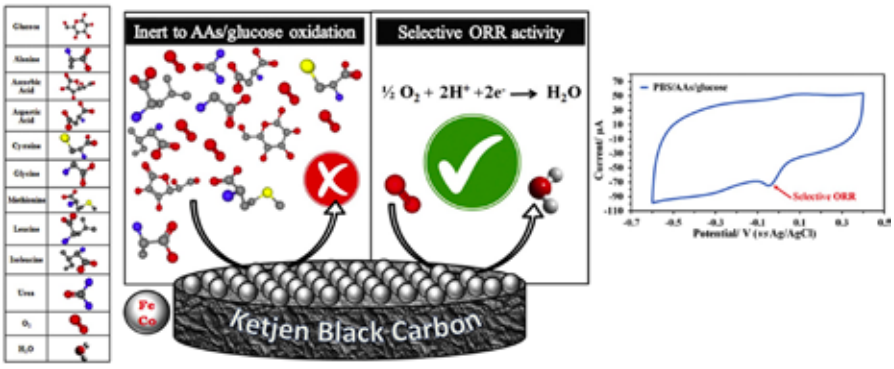
- **Organic Chemistry:**
  Chemistry of Pharmaceuticals and Biologically Active Compounds, Polymer Chemistry, Catalysis, Physical Organic Chemistry, Carbon Nanostructure and Their Applications as Adsorbents, Sensors, Catalysts, Covalent Organic Framework, Ionic Liquids and their Applications in Organic Reactions, Novel Nanocatalysts, Heterogeneous Catalysts, Novel Optical Active Polymers, Synthsis of Organic Compounds under Solid-State Conditions, Polymersomes as Drug Delivery Systems, Biological Active Molecules including Anticancer Medicines, Bionanotechnology, and Biomass.

- **Physical Chemistry:**
  Theoretical and Quantum Computational Chemistry, Quantum Theory of Atoms in Molecules (QTAIM), Ion Mobility Spectrometry (IMS), Sensors, Laser Spectroscopy, Time of Flight Mass Spectrometry, Fuel Cells, Electrochemistry, Thermodynamics of Equilibrium and Non-equilibrium Systems, MD Simulation, Synchrotron Radiation and Free Electron Laser-based Experiments, Industrial Electrochemistry, Laser Desorption-Ionization (LDI), Matrix-Assisted Laser Desorption Ionization (MALDI), Nanothermodynamics, Surface Engineering, Corrosion & Coating, Photochemistry and Photoelectrochemistry, Solar Cells (Dye-Sensitized Solar Cells), Batteries and Supercapacitors, Nanomaterial and Nanochemistry.

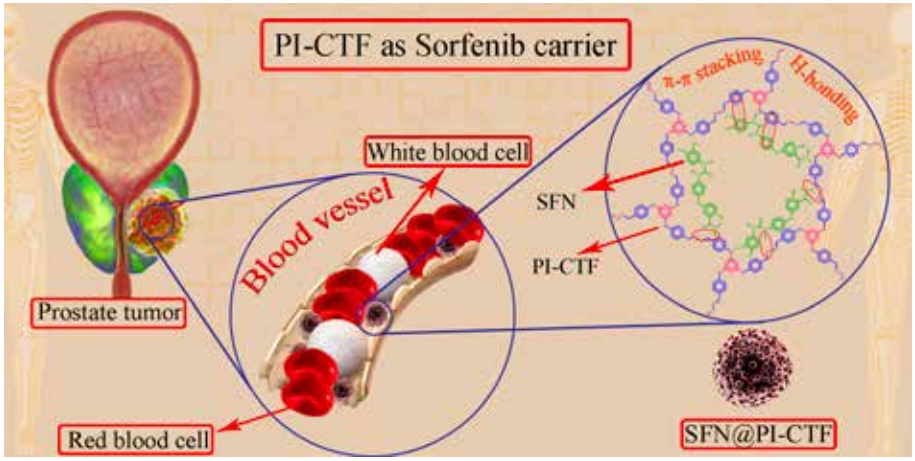
- **Inorganic and, Nanobioinorganic and Bioinorganic Chemistry:** Electrocatalysts, Photocatalysts, Synthesis of Transition Metal Complexes, Organometallics, Inorganic Photochemistry, Inorganic Electrochemistry, Supramolecular Chemistry, Anticancer Drugs and Metal-drug Complexes, Nanobioinorganic Chemistry, Advanced Materials, Magnetochemistry, Nanomaterials, Inorganic Nanocarriers, Semiconductors, Nanocatalysts, Inorganic Pigments, MOFs, Inorganic Polymers, and Industrial Inorganic Chemistry.



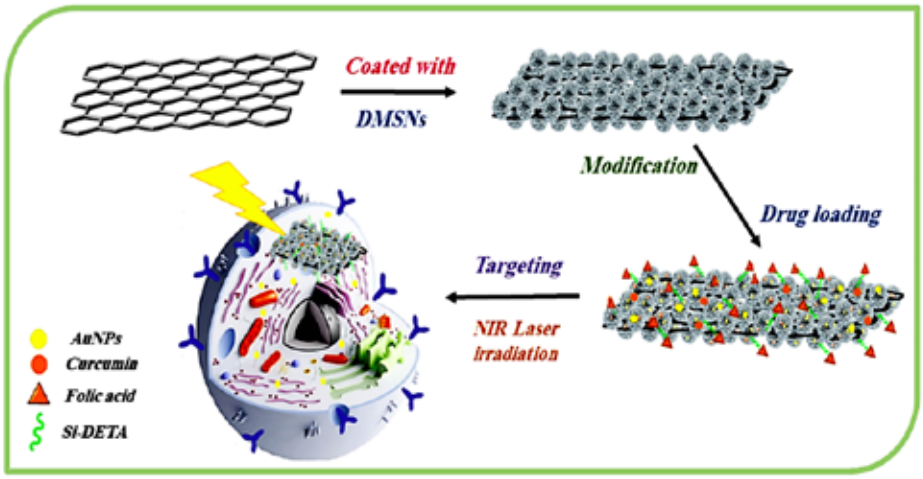
Yolk-shelled CuCo2Se4 Microspheres as a Novel Electrode Material for Supercapacitor Application



Carbon Supported Fe–Co Electrocatalyst for Selective Oxygen Reduction in Glucose Fuel Cell



Novel High Surface Area Porous Covalent Organic Framework as a Biocompatible Nanocarrier



A Nanocarrier for Curcumin Targeted Delivery and Cell Imaging

Research Laboratories

- Central Lab

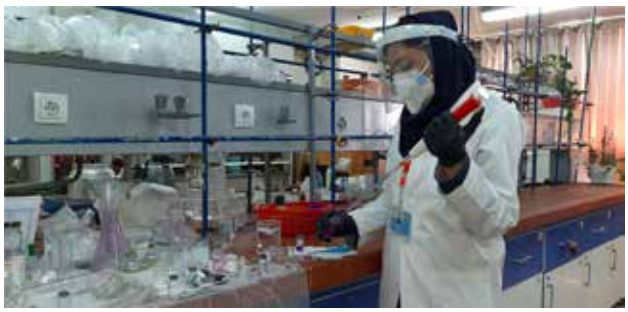
- Green Energy Developemt Lab

- Ion Mobility & Mass Spectrometry Lab

- Ion Mobility Spectrometry Lab

- Laser Spectroscopy & Time of Flight Mass

- Polymer & Advanced Material Lab

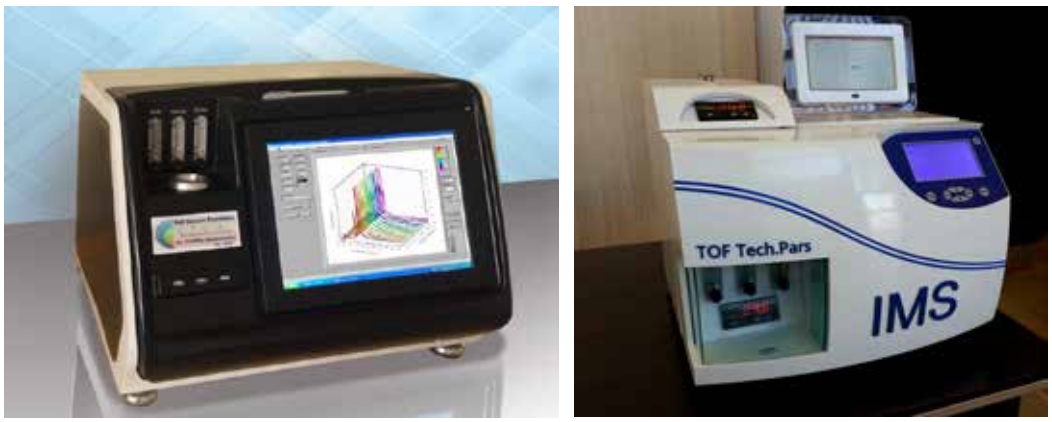


- Pharmaceutical Lab

Industrial Projects

The Department of Chemistry at IUT is one of the active departments in the cooperation with industry. All faculty members are somehow involved in the projects in industry and solving the problems of the industries in Iran in addition to their routine scientific activities. Several important performed industrial projects of the department are:

- Construction of Mobarakeh steel reduction gas sensor and installation in the production line.
- Construction of the Ion Mobility Mass Spectrometer (IMS).
- Construction of Time of Flight Mass Spectrometer (TOF-MS).
- Construction of Liquid Chromatography- Ion Mobility Mass Spectrometer (LC-IMS)
- Construction of Gas Chromatography- Ion Mobility Mass Spectrometer (GC-IMS)
- Construction of Automatic Narcotic Material Detection Device Based on Ion Mobility Mass Spectrometery.



Two Types of Ion Mobility Mass Spectrometer Constructed in the Department of Chemistry

- Construction of chlorine sheet measuring device for Mobarakeh Steel Complex.
- Construction of a device for determining the thickness of the tin layer in tin-plated sheet for Mobarakeh Steel Complex.
- Manufacturing a fully automatic and on-line transformer oil machine for the Ministry of Energy.
- Construction of fully automatic XRF cooling system for Mobarakeh Steel Complex.
- Manufacture of fully automatic and on-line H2S gas sensor for Mobarakeh Steel Complex.
- Construction of a device for the extraction and chemical reaction in the supercritical fluid.
- Technical production knowledge of P-toluenesulfonic acid (PTSA).
- Preparation of slow release urea for ruminants.
- Preparation of protected amino acids including methionine and lysine for ruminants.
- Quality control of the silicone insulator coating used in the power industry.
- Possible application of essential oils to eliminate the negative effects of chemical odorants; Pilot plant study of the proposed essential oils in the natural gas distribution network.
- Catalytic conversion of SO2 released from the roasting process of copper sulfides to SO3 by new nanocatalysts of vanadium(V) oxide, Sarcheshmeh Copper Complex (SCC) 2017.

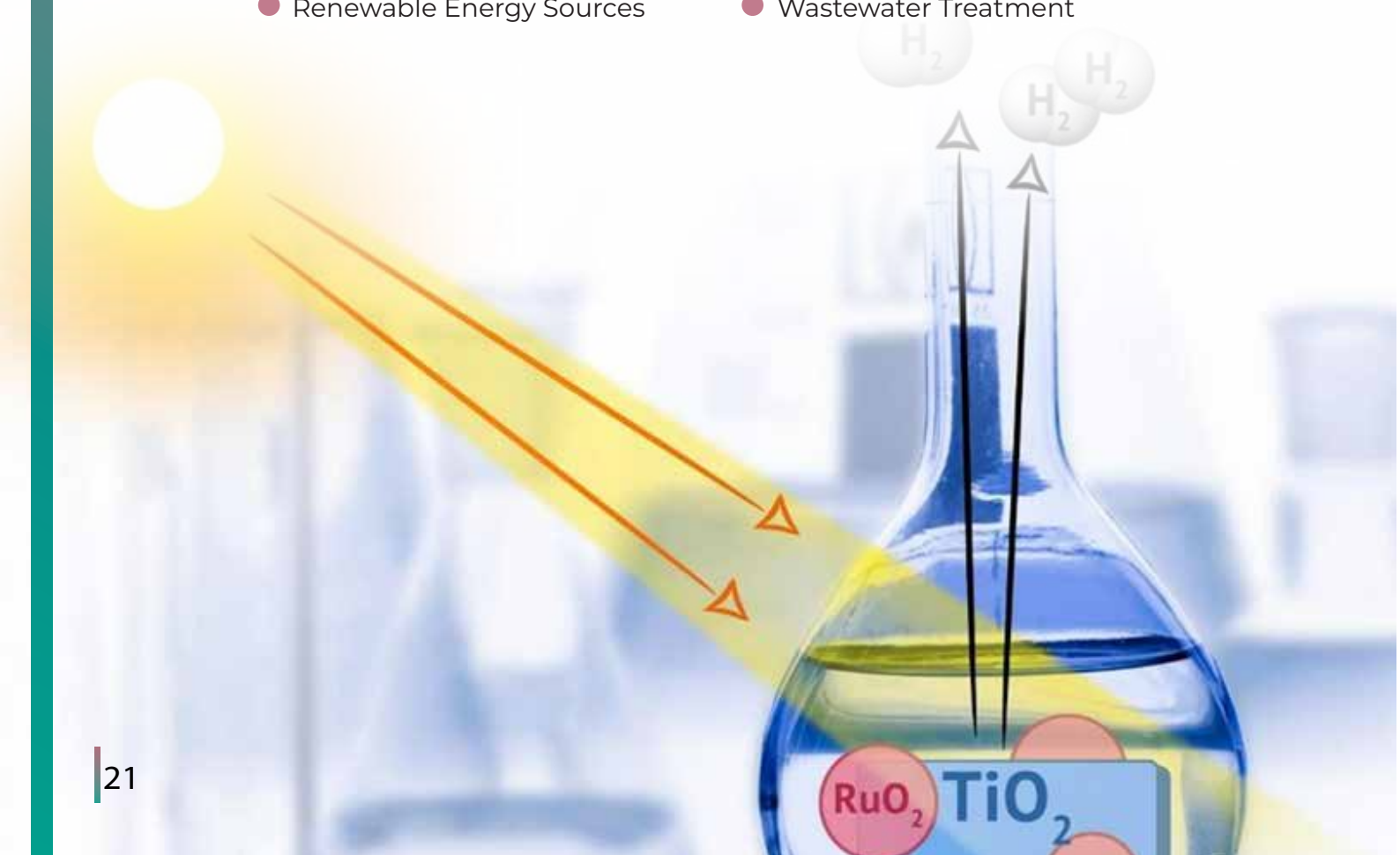
Inventions and Innovations

- Non-Radioactive Electron Capture Detector, US Patent 2009/0242783A
- Method for preparing silica-dysprosium oxide core-shell nanoparticles US Patent 2015/8,993,057
- Method for preparation of ZnS and CdS nanoparticles for dechlorination of polychlorobiphenyls in oils. US Patents, 20110160512 A1.
- Synthesis and characterization of new optically active polyamides using economic and green method in tetrabutylammonium ionic liquid (gold and silver medal from Korea International Women,s Invention Exposition).
- Research Grade Ion Mobility Spectrometer.
- Design and construction of gas chromatography-corona discharge ion mobility spectrometry (GC-IMS).
- Design and construction of liquid chromatography-electrospray ionization ion mobility spectrometry.
- On-Line Gas separating & Sensing for Steel Production Partin Mobarakeh Steel Complex (Isfahan, Iran).
- On-Line H2S Gas Sensor for Mobarakeh Steel Complex (Isfahan, Iran).
- On-Line CO-CO2 Gas Sensor for Mobarakeh Steel Complex (Isfahan, Iran).
- Design and construction of electrospray ionization ion mobility spectrometry (ESI-IMS).
- High Voltage as Ionization Source for Ion Mobility Spectrometry.
- Design and construction of low temperature plasma - ion mobility spectrometry (LTP-IMS).

Interdisciplinary Approaches

Nowadays, the cutting-edge scientific research progressively more occurs at the interface of disciplines, and equipping students to recognize interdisciplinary connections is essential for preparing the next generation of researchers, health workers, and policymakers to solve the toughest scientific problems. In this regards, the researches in the department of chemistry at IUT have been moved to a direction to interest the graduate and undergraduate students to interdisciplinary research related to the following subjects:

- Medicine
- Drug desgin
- Novel Durg Delivery Systems
- Life Science
- Atomspheric Chemistry
- Biology
- Green Chemistry
- New Energy Sources
- Renewable Energy Sources
- Enviromental Chemistry
- Biomass Conversions
- Biofuels
- Sensor and Biosensor
- Energy Storage
- Biotechnology
- Battery and Supercapasitors
- Surface Enginnering
- Wastewater Treatment



Contributions to Sustainable Development and its Impacts on Society

Recently, the department of Chemistry at IUT has tried to change the mode of education from the discipline-based instructions to concept-application based to direct the undergraduate and graduate students for thinking about the specific application of their learned chemistry in the interdisciplinary research and the main problem of the today's world related to water, food, air pollution, and especially energy. The department of chemistry tries to direct the graduate students to research outside of the laboratory to solve the problem of the industry related to the society to really show that "Chemistry is life". The different research projects are introduced to the department of chemistry related to the different industrial companies in connection with society.

We would like to express our sincere thanks to the faculty members at the Department of Chemistry, and our colleagues at International Scientific Cooperation Center (ISCC) for sincere assistance in producing this prospectus.

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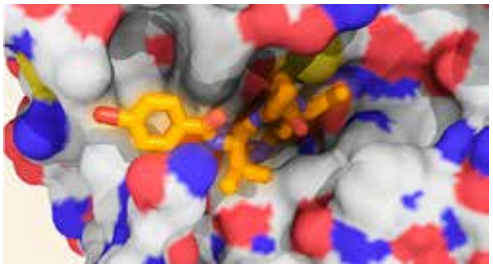

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