Inorganic materials synthesis Research Laboratory

Inorganic materials synthesis Lab was established in Chemistry Department in 2011. This is one of the research network labs of Iran University of Science and Technology. The active research fields in this lab are:

- **Crystallography**

  (Synthesis, characterization, crystal structure determination)

- **Nanomaterials**

  (Synthesis, characterization, application)

- **Synthesis and characterization of inorganic complexes**

  (Synthesis and characterization of organic compound as ligand, application, crystal structure determination)

Purposes

- Teaching of the search in the scientific databases and the correct research methods.
- Study of inorganic compounds (complexes, Ligands, crystals, natural inorganic materials, nanomaterials), characteristies, properties and their applications.
- Study of various synthesis methods of materials (solid state, co-precipitation, hydro/solvothermal, microwave, ultrasound,…).
- Teaching of the various analyses in characterization of synthesized materials and their interpretation (FT-IR, UV-Vis, XRD, SEM, TEM, EDX,…).
- Teaching of the x-ray diffraction pattesrns interpretation, data analysis, working with the related softwares.
- Providing the opportunities and facilities for receiving and performing research and industrial projects.
- The use of new methods of analyses for design of research projects shared by the other groups of university and or elsewhere.

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Publications

• ISI

1- Synthesis and characterization of CdO nanocrystalline structure by mechanochemical method, Materials Letters, 65 (2011)1025.

2- A novel nanostructure of cadmium oxide synthesized by mechanochemical method, Materials Research Bulletin, 46(11)(2011)1949.

3- Dibromido(2,9-dimethyl-1,10-phenanthroline-2N,N')zinc, Acta Crystallographica E68 (2012) m811.

4- Bis(2-amino-3-methylpyridine)-dichloridocobalt(II), Acta Crystallographica E68 (2012) m1099.

5- Preparation and characterization of nano-porous silica aerogel from rice husk ash by drying at atmospheric pressure, Materials Research Bulletin 47(2012)2584.

6- Di-μ-chlorido-bis[(2-amino-4-methylpyridine-N)chloridomercury(II)], Acta Crystallographica E68 (2012) m1300.

7- (Acetato-κ(2)O,O’)(acetato-κO)bis(2-amino-3-methyl-pyridine-κN(1))cobalt(II), Acta Crystallographica E68 (2012) m1260.

8- Synthesis, characterization and microwave absorbing properties of the novel ferrite nanocomposites, Journal of Alloys and Compounds 542(2012)43.

9- Preparation of $AgInS_2$ nanoparticles by a facile microwave heating technique; study of effective parameters, optical and photovoltaic characteristics Original Research Article, Applied Surface Science, 263(2012)449.

10- Preparation, Characterization and Photocatalytic Properties of Ba-Cd-Sr-Ti Doped Fe_3O_4Nanohollow Spheres on Removal of Congo Red Under Visible-Light Irradiation, Journal of Superconductivity and Novel Magnetism , 26(1)(2013) 219.

11- Synthesis and characterization of the special ZnO nanostructure by mechanochemical process, Materials Letters, 92(2013)108.

12- Determination of trichloroacetic acid (TCAA) using CdO nanoparticles modified carbon paste electrode, Electroanalysis, 25(2)(2013)487.

13-Construction of a new Pr^{3+}-PVC membrane sensorbased on 2,3,4,5-tetra-(4-pyridiyl)-thiophene, Journal of the Indian Chemical Society, 90(2013)279.

14- Experimental design to optimize the synthesis of CdO cauliflower-like nanostructure and high performance in photodegradation of toxic azo dyes, Materials Research Bulletin, 48(3) (2013)935.

15- Fabrication of a PVC membrane samarium(III) sensor based on N, N, N"-tris (4-pyridyl)trimesic amide as a selectophore, Materials Science and Engineering C, 33(2) (2013)870.

16- $Ba_{0.69}Sr_{0.17}Cd_{0.07}Zn_{0.07}Fe_{12}O_{19}$ nanostrucutres/conducting polyaniline nanocomposites; synthesis, characterization and microwave absorption performance, Journal of Alloys and Compounds 554(2013)284.

17- A novel electrochemical sensor based on metal-organic framework for electro-catalytic oxidation of L-cysteine, Biosensors and Bioelectronics, 42(2013)426.

18- A novel magnetic metal organic framework nanocomposite for extraction and preconcentration of heavy metal ions, and its optimization via experimental design methodology, MicrochimActa, 180(11) (2013)1073.

19- Experimental investigation of thermo-physical properties of platelet mesoporous SBA-15 silica particles dispersed in ethylene glycol and water mixture, Ceramics International, 39 (2013)7649.

20- Thermal conductivity studies of novel nanofluids based on metallic silver decorated mesoporous silica nanoparticles, Materials Research Bulletin, 48(3) (2013)4150.

21-Ho^{3+}-PVC membrane potentiometric electrochemical sensor based on2-acetylfurane thiosemicarbazone as an ionophore, Journal of the Indian Chemical Society, 90(2013)1347.

22- Synthesis of tetrakis(carboxyphenyl)porphyrin coated paramagnetic iron oxidenanoparticles via amino acid for photodegradation of methylene blue, Turkish Journal of Chemistry, 37 (2013)879.

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28- Synthesis, characterization, and optical properties of lead(II)coordination polymers and nanosize lead oxide core of polymer, Monatshefte für Chemie, 146(2015)35.

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30- Innovative one pot synthesis method of the magnetic zinc ferrite nanoparticles and study of effective parameters, Materials Letters, 152(2014)57.

31- Photocatalytic activity of mesoporousmicrobricks of ZnO nanoparticles prepared by the thermal decomposition of bis(2-aminonicotinato) zinc(II), Chinese Journal of Catalysis, 36(2015)742.

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33- $ZnFe_2O_4$ nanoparticles and clay encapsulated $ZnFe_2O_4$nanohybrid; synthesis strategy, structural characteristics and adsorption of contaminants in water, RSC Advances 5(2015) 56145.

34- Facile and one pot microwave synthesis of metal organic framework Copper Terephthalate and its application for CO_2 and CH_4 adsorption, Journal of Porous Materials, 22(2015)1161.

35- Mixed ammonium silver phosphomolybdate salt nanostructures; solid state synthesis, characterization of driving agent role and photocatalytic property, Materials Letters, 161(2015)464.

36-Microwave-assisted synthesis of bismuth oxybromochloride nanoflakes for visible light photodegradation of pollutants, Physica B: Condensed Matter, 475(2015)14.

37- Document Simplified synthesis of $Fe_2(MoO_4)_3$ nanoparticles by microwave-assisted combustion, Journal of the Australian Ceramic Society, 51(2015)94.

38- Solid state preparation and photocatalytic activity of bismuth oxybromide nanoplates, Research on Chemical intermediates (2015) inpress.

39- Mechanochemically prepared BiOCl nanoplates for removal of Rhodamine B and pentachlorophenol, Monatshefte für Chemie (2015) inpress.

40- Photocatalytic activity of CuO nanoparticles incorporated in a mesoporous structure prepared from bis(2-aminonicotinato) copper (II) microflakes, Transactions of Nonferrous Metals Society of China (2015) inpress.

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1. Determination of samarium and fluoride ions in solution samples by a constructed sm^{3+} PVC-membrane sensor, Journal of Chemical and Pharmaceutical Research, 3(4)(2011)804.

2. Synthesis, characterization and adsorption capability of CdO microstructure for Congo red from aqueous solution, Journal of Nanostructures, 2(2012)9.

3. Application of experimental design to optimize the synthesis of CdO cauliflower-like nanostructure using mechanochemical method, Journal of Nanostructures, 2(2012)127.

4. Synthesis and Charaterization of Magnesium Oxide Mesoporous Microstructures Using Pluronic F127, Journal of Nanostructures, 2(2012)273.

5. The removal of 2,4-dichlorophenol under visible light irradiation by silver indium sulfide nanoparticles synthesized by microwave, Current Chemistry Letters, 2 (2013) 77.

6. Synthesis and Characterization of Hydrophobic Silica Aerogel byTwo Step(Acid-Base) Sol-Gel Process, Journal of Nanostructures, 2(2013)181.

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8. Application of a facile solid-state process to synthesize the CdO spherical nanoparticles, International Nano Letters, 3 (2013) 1.

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10. A green synthesis of copper oxide nanoparticles by mechanochemical method, Current Chemistry Letters, 2 (2014) 215.

11. Synthesis and crystal structure of a new thiosemicarbzone, acenaphthenequinonethiosemicarbazone mono methano Iranian Journal of Crystallography and Mineralogy, 4 (2015)109.

12.Nanosheets of BiOCl incorporated in microflowers: Microwave assisted synthesis and dye-photosensitized removal of pollutants, Journal of Nanostructures, 5(2015)1.

- **Conferences**

1- Synthesis and characterization of $AgInS_2$ nanoparticles by microwave assisted chemical precipitation, 15th international electronic conference on synthetic organic chemistry, 2011.

2- Synthesis, Characterization and Application of ZnSNanocrystals, 3rd international conference on Ultrafine Grained and NanoStructured Materials, Tehran, 2011.

3- Hydrothermal synthesis of Vanadium Oxide nanorods and the study of their formation mechanism, 3rd international conference on Ultrafine Grained and NanoStructured Materials, Tehran, 2011.

4- $Ba_{0.34}Sr_{0.34}Cd_{0.16}Zn_{0.16}Fe_{12}O_{19}$ Nanoparticles Preparation characterization and applications in microwave absorption, 3rd international conference on Ultrafine Grained and NanoStructured Materials, Tehran, 2011.

5- Preparation and photocatalytic characteristics of $Ba_{0.75}Cd_{0.25}SrTiFe_{10}O_{19}$ hallow nanosperes, 3rd international conference on Ultrafine Grained and NanoStructured Materials, Tehran, 2011.

6- Synthesis and Characterization of ZnO Nanostructure by mechanochemical method, 4th International Conference on nanostructures, 2011.

7- Synthesis and characterization of AgInS2 nanoparticles by microwave assisted chemical precipitation, 15th international electronic conference on synthic organic chemistry, 2011.

8- Synthesis of zinc sulfide nanostructure via hydrothermal route, 13th Iranian Inorganic Chemistry Conference, 2011.

9- Preparation of iron oxide nanopartcles by mechanochemicalreaction, 15th Iranian Chemistry Congress, 2011.

10- Preparation of nickel oxide nanorods by ultrasound method, 15th Iranian Chemistry Congress, 2011.

11- Facile synthesis of ZnS nanoparticles via ultrasonic irradiation method, 1st National Iranian New Chemistry Congress, 2011.

12- Synthesis and characterization of NiO nanoparticles via thermal decomposition, 1st National Iranian New Chemistry Congress, 2011.

13- Preparation of iron oxide nanoparticles by co-precipitation method, 1st National Iranian New Chemistry Congress, 2011.

14- Honeycomb Microstructures of Zinc Oxide Nanoparticles from Direct Thermal Decomposition, International Congress on Nanoscience and Nanotechnology, 2012.

15- A Facile Solvothermal Method to Obtain Magneisum Oxide Nanoparticles, International Congress on Nanoscience and Nanotechnology, 2012.

16- Preparation of silver Indium sulfide nanorods by a facile Microwave approach, 16th international electronic conference on synthetic organic chemistry, 2012.

17- Preparation of 2-pyridinecarbaldehyde thiosemicarbazone by Microwave irradiation, 16th international electronic conference on synthetic organic chemistry, 2012.

18- Synthesis of ZnO Nanostructure by Mechanical Milling Process Using Starch as a Template, Iran-Belarus International Conference on Modern Applications of Nanotechnology, 2012.

19- Synthesis and Characterization of the CdO Necklace-like Nanostrands by Using Succinic acid , Iran-Belarus International Conference on Modern Applications of Nanotechnology, 2012.

20- Synthesis and Characterization of MgO Nanoparticles Using PEG as a Surface Active Agent, Iran-Belarus International Conference on Modern Applications of Nanotechnology, 2012.

21- Determination of Trichloroacetic Acid (TCAA) Using CdO Nanoparticles Modified Carbon Paste Electrode, Iran-Belarus International Conference on Modern Applications of Nanotechnology, 2012.

22- Synthesis and Characterization of $AgInS_2$ - Iran-Belarus International Conference on Modern Applications of Nanotechnology, 2012.

23- Synthesis and Photovoltaic characteristics of $AgInS_2$ nanoparticles by a simple route, 14th Iranian Inorganic Chemistry Conference, 2012.

24- Solvothermal synthesis of MgO nanoparticles using pluronic F127 triblock copolymer, 4th Iranian Inorganic Chemistry Conference, 2012.

25- Surfactant Assisted Synthesis of MgO Nanoparticles, 14th Iranian Inorganic Chemistry Conference, 2012.

26- Synthesis and Characterization of ZnO Nanorods by a Fasile Solid State Reaction, 14th Iranian Inorganic Chemistry Conference, 2012.

27- Influence of the reaction parameters on the size of SiO_2 nanoparticles, 14th Iranian Inorganic Chemistry Conference, 2012.

28- Synthesis and Characterization of Coordination Compounds of 1,2,3,4-Tetra (4-pyridyl) Thiophene with Co, Cu, Hg, Zn , 14th Iranian Inorganic Chemistry Conference, 2012.

29- Synthesis and characterization of CuO nanowires by mechanochemical method, 15th Iranian Inorganic Chemistry Conference, 2013.

30- Microwave-assisted synthesis of Cd (II) complex of 4-pyridinecarboxaldehyde thiosemicarbazone, 17th international electronic conference on synthetic organic chemistry, 2013.

31- Synthesis, characterization and crystal structure of a new supramolecular system containing triorganotin(IV) and 1,3,5- Benzenetricarboxylic acid, 17th international electronic conference on synthetic organic chemistry, 2013.

32- Synthesis and characterization of 4-pyridine carboxaldehyde thiosemicarbazone, 17th international electronic conference on synthetic organic chemistry, 2013.

33- Preparation of activated carbon with high surface area from Pistacia Aatlantica shell, 18th international electronic conference on synthetic organic chemistry, 2014.

34-Ethylenediaminetetraacetic Acid-Assisted Synthesis of Nano Antimony Oxide by Microwave Method, 18th international electronic conference on synthetic organic chemistry, 2014.

35- Microwave assisted preparation of bismuth oxyhalidemicroflowers comprised of nanolayers and investigation of its photocatalytic activity, 18th international electronic conference on synthetic organic chemistry, 2014.

36- Glycine Assisted Synthesis of $ZnFe_2O_4$ Nanoparticles by One Pot Microwave Heating Route and Organic Pollutant Adsorption for Water Treatment, 16th Iranian Inorganic Chemistry Conference, 2014.

37- Microwave Preparation of Uniform CeO_2/Organo-Clay Nanoparticles and its Composition with Resin Epoxy, 16th Iranian Inorganic Chemistry Conference, 2014.

38- A Simplified Microwave-Assisted Synthesis of $NiMoO_4$ Nanoparticles by Using Organic Driving Agent and Study of Photocatalytic Activity, 16th Iranian Inorganic Chemistry Conference, 2014.

39- Bismuth Oxybromide Nanosheets: Microwave Synthesis, Growth into Microflowers and Photocatalytic Activity, 16th Iranian Inorganic Chemistry Conference, 2014.

40- Preparation of magnetic mesoporousgraphene from microwave graphitization of waste material, 16th Iranian Inorganic Chemistry Conference, 2014.

41 Synthesis and characterization of $CoMoO_4$ through a rapid microwave assistant method, 16th Iranian Inorganic Chemistry Conference, 2014.

42- Preparation of CuO nanostructures by ball milling method and the influence of ball milling time on morphology, 16th Iranian Inorganic Chemistry Conference, 2014.

43- Synthesis, characterization of CuO nanowires and study of its catalytic application, 16th Iranian Inorganic Chemistry Conference, 2014.

44- Synthesis and characterization of CeO_2/organo-clay nanoparticles by a facile microwave technique, 16th Iranian Inorganic Chemistry Conference, 2014.

45- A simple green synthesis of zinc ferrite nanoparticles, 16th Iranian Inorganic Chemistry Conference, 2014.

46- Synthesis and characterization of magnetic zinc ferrite nanparticles by microwave heating method, 16th Iranian Inorganic Chemistry Conference, 2014.

47- The synthesis of ZrO_2/organo-clay nanocomposite by a facile reflux reaction, 16th Iranian Inorganic Chemistry Conference, 2014.

48-Mechanochemical preparation of $Bi_{1.66}O_{1.4}Cl$ nanoplates and its efficient hotodegradation of rhodamine B, 16th Iranian Inorganic Chemistry Conference, 2014.

49- Rapid preparation of $Bi_{2.92}O_{1.98}Br$ nanoflakes via a green solid state method, 16th Iranian Inorganic Chemistry Conference, 2014.

50- Synthesis and characterization Fe_3O_4@ functionalized- SBA-15 mesoporous silica by N-(2-hydroxyethyl) salicylaldimine, 16th Iranian Inorganic Chemistry Conference, 2014.

51- Microwave assisted fabrication of $Bi_{2.27}O_{9.31}Cl$ microflowers comprised of nanolayers and its application as a photocatalyst, 16th Iranian Inorganic Chemistry Conference, 2014.

52-Facile Synthesis of MCM-41/Cu(BDC) metal organic framework hybrid and study its application for CO_2 separation, 2nd Iran National zeolite Conference, 2015.

53-The synthesis of Bi_2WO_6/MCM-48 mesoporousnanocomposite, 2nd Iran National zeolite Conference, 2015.

54-In Situ Soft Chemistry Preparation of ZrO_2/pillared organoclay, 2nd Iran National zeolite Conference, 2015.

55-A facile and green synthesis of Bi_2MoO_6 nanostructure supported on the MCM-48 mesoporous silica, 2nd Iran National zeolite Conference, 2015.

56-Preparation and characterization of nano-sized $ZnMoO_4$/MCM-48composite by a facile ultrasound assisted impregnation, 2nd Iran National zeolite Conference, 2015.

57-Mechanochemical preparation of Bi_2MoO_6 flower-like nanostructure for photocatalytic degradation of dye pollutants, 5thinternational conference on Ultrafine Grained and Nanostructured Materials, 2015.

58-Nanostructured ZnO/MoO_3 mixed metal oxide; synthesis, characterization and application in water treatment, 5thinternational conference on Ultrafine Grained and Nanostructured Materials, 2015.

59-Solvent free synthesis of Bi_2WO_6 squared plate-shape nanostructure and its photocatalytic properties, 5thinternational conference on Ultrafine Grained and Nanostructured Materials, 2015.

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