CURRICULUM VITAE ET STUDIORUM

Dr. Anna Irto was born in Reggio Calabria (Italy) on 5th March 1989.

EDUCATION AND ACADEMIC CAREER

29th March 2011: **Bachelor's Degree in Chemistry** (class 21) at the University of Messina (Italy), mark 106/110.
24th October 2013: **Master's degree in Chemistry** (class LM54) at the University of Messina (Italy), mark 107/110.
12th March 2013: **qualification as chemist** at the University of Messina (Italy), mark 141/150.
15th February 2017: **PhD title in Chemical Sciences with mention of "Doctor Europaeus" (XXIX Cycle**, three-year period 2014-2016**)** at the University of Messina (Italy), thesis discussed in English language entitled "BINDING ABILITY OF SOME COMMERCIALLY AVAILABLE AND SYNTHESIZED LIGANDS TOWARDS METAL CATIONS OF ENVIRONMENTAL AND BIOLOGICAL INTEREST".
4th September 2017-3rd September 2018: **post-Doctoral research grant** (CUN 03 area, SSD CHIM/01), project "Multiple equilibria in natural and biological fluids: from speciation to selective sequestration".
1st October 2018-30th September 2019, 10th October 2019-9th October 2020, 5th November 2020-4th November 2021: **3 post-Doctoral research grants** (CUN 03 area, SSD CHIM/01, Analytical Chemistry), project "Analysis of classes of polyfunctional ligands for the speciation and selective sequestration of metal and organometal cations in natural and biological systems".
31st December 2021-30th December 2024: **fixed-term Researcher – type A** at the Chemical, Biological, Pharmaceutical and Environmental Sciences (CHIBIOFARAM) Department of the University of Messina (Italy), PON "RESEARCH AND INNOVATION" 2014-2020, SC 03/A1 - SSD CHIM/12 (Environmental and Cultural Heritage Chemistry), GREEN topic, three-years research project "Recovery, reuse and enhancement of processing waste citrus fruits".
12th July 2024 - present: **Italian National Scientific Qualification (ASN)** for appointment as **Associate Professor** (Second Academic Rank) in SC 03/A1 – Analytical Chemistry.
31st December 2024 – 30th September 2026: **two-year extension** of the fixed-term **Researcher (RTD-A)** contract in SC 03/CHEM-01 and SSD CHEM-01/B (formerly SSD CHIM/12, Environmental and Cultural Heritage Chemistry), at the CHIBIOFARAM Department of the University of Messina (Italy).
Since 1st October 2026 (6 years contract already signed, Protocol 2026-UNMECLE-0097198, 17th July 2026): **Tenure-Track Assistant Professor (RTT)** contract in SC 03/CHEM-01 and SSD CHEM-01/B (formerly SSD CHIM/12, Environmental and Cultural Heritage Chemistry), at the CHIBIOFARAM Department of the University of Messina (Italy).

MATERNITY LEAVE

29th April 2025 – 28th September 2025: Five-month postnatal maternity leave, Rector's Decree No. 1314/2025 (Protocol No. 0072040 of 20 May 2025), following the birth of her son, Alessandro Assumma, on 29 April 2025 (Protocol No. 62812/2025).

INTERNSHIPS, TRAINING PLACEMENTS AND INDUSTRIAL EXPERIENCE

Academic Year 2009/2010: laboratory activity (3 ECTS credits, 40.5 hours; 1 ECTS = 13.5 hours) at the Department of Inorganic Chemistry, Analytical Chemistry and Physical Chemistry, , within the research topic *"Determination of thermodynamic parameters of metal-ligand complex formation by electrochemical techniques"*. Supervisor: Prof. Francesco Crea.
1st April 2010 - 31th December 2010: Internship (8 ECTS credits, 108 hours; 1 ECTS = 13.5 hours) at the **Regional Agency for Environmental Protection of Calabria (ARPACal)**, Reggio Calabria (Italy). Activities included sampling of drinking water intended for human consumption in the intensively cultivated

Gioia Tauro Plain (Reggio Calabria), physicochemical analysis of water samples, determination of metals by ICP-OES, and analysis of organochlorine pesticides by gas chromatography. Industrial Supervisor: Dr. Giuseppa Marino.
23rd January 2023 – 23rd July 2023: Research activity at **Capua 1880 S.r.l.**, within the framework of the three-year research project *"Recovery, Reuse and Valorisation of Citrus Processing By-products"*, funded under the PON "Research and Innovation" 2014–2020, SC 03/A1, SSD CHIM/12 (Environmental and Cultural Heritage Chemistry), GREEN thematic area.

RESEARCH PERIODS ABROAD

10th April–30 September 2015: **visiting PhD scholar** at the Universidade de Lisboa (Portugal), supervisor: Prof. M. A. Santos. Activities: synthesis, purification and characterization of 3-hydroxy-4-pyridinones, compounds potentially employed for the remediation of toxic metal cations from environmental and biological matrices.
30th April-22nd May 2018: **research activity** at the Friedrich-Schiller-Universitàt Jena, Jena (Germany), supervisor: Prof. Winfred Plass. Italian-German project MIUR-DAAD Joint Mobility Program entitled: "Metal uptake by Azotobacter Vinelandii metallophores: a thermodynamic approach" 2018-2020. Activities: synthesis, purification and characterization of metallophores, compounds potentially exploitable for metals removal from environmental and biological matrices.

AWARDS

1. "***NJC***" (New Journal of Chemistry) award for the best poster presentation, contribution entitled: "Bis-3-hydroxy-4-pyridinones: From the synthesis to the complexation with Al^{3+} and Fe^{3+} and the biological assays", authors: A. Irto, K. Chand, R.M. Cigala, F. Crea, L. Gano, C. De Stefano, S. Sammartano, M.A. Santos, awarded in Dijon (France) during the *International Symposium on Metal Complexes 2017* (*ISMEC 2017*).
2. "***Fernando Pulidori Prize***", award reserved to young researchers for their research in the fields of the thermodynamic and/or kinetic studies on solution equilibria, received in Debrecen (Hungary) during the *International Symposium on Metal Complexes 2019* (ISMEC 2019).

SCHOLARSHIPS FOR PARTICIPATION IN SCHOOLS AND CONFERENCES

28th August – 1st September 2017: **scholarship** to attend the 3rd Summer School of Bioinorganic Medicinal Chemistry, granted by the School Organizing Committee.
16th – 20th September 2018: **scholarship** to attend the 27th National Congress of the Analytical Chemistry Division, granted by the Executive Board of the Analytical Chemistry Division of the Italian Chemical Society.
11th – 14th June 2019: **scholarship** to attend the International Symposium on Metal Complexes 2019 (ISMEC 2019), granted by the Conference Organizing Committee.
22nd – 26th September 2019: **scholarship** to attend the 29th Congress of the Analytical Chemistry Division, granted by the Executive Board of the Analytical Chemistry Division of the Italian Chemical Society.
14th – 23rd September 2021: **scholarship** to attend the 17th National Congress of the Italian Chemical Society, granted by the Executive Board of the Analytical Chemistry Division.
1st – 2nd December 2022: **scholarship** to attend the Joint Conference of the Calabria and Sicily Sections of the Italian Chemical Society (SCICaSi 2022), granted by the Executive Board of the Sicily Section of the Italian Chemical Society.
26th -30th August 2024: **scholarship** ("1000BORSE – SCI Junior Member") to attend the 28th National Congress of the Italian Chemical Society, granted by the Executive Board of the Analytical Chemistry Division of the Italian Chemical Society.

CONFERENCES ORGANIZATION

Messina (Italy), 13st September 2026

9th – 10th February 2017: **member of the Organizing Committee** of the Workshop of the Sicily and Calabria Sections of the Italian Chemical Society 2016–2017.
3rd December 2020: **member of the Organizing Committee** of the Workshop of the Sicily Section of the Italian Chemical Society 2020.
11th - 15th September 2022: **member of the Organizing Committee** of the 29th Congress of the Analytical Chemistry Division of the Italian Chemical Society.
25th - 26th February 2024: **member of the Organizing Committee** of the 4th European NECTAR Conference and Final Action Meeting.

PARTICIPATION IN SCHOOLS

25th - 30th September 2016: 10th National School of Analytical Chemistry for PhD Students, organized by the Analytical Chemistry Division of the Italian Chemical Society.
28th August - 2nd September 2017: 3rd Summer School of Bioinorganic Medicinal Chemistry, organized by the University of Cagliari, Department of Chemical and Geological Sciences.
30th November – 3rd December 2020: 7th National School of Environmental and Cultural Heritage Chemistry, organized by the Environmental and Cultural Heritage Chemistry Divisions of the Italian Chemical Society.
24th - 26th November 2021: 6th National School of Environmental Monitoring: Contaminated Sites, organized by the Environmental and Cultural Heritage Chemistry Divisions of the Italian Chemical Society.
9th -11th September 2024: 3rd Edition of the International School on Water Reuse (ISWR), organized by the University of Turin, Department of Chemistry.

PARTICIPATION IN FUNDED RESEARCH PROJECTS

20th June 2016 - 5th February 2020: Research participant in the **PRIN 2015 project** "Multiple Equilibria in Natural and Biological Fluids: From Speciation to Selective Sequestering." Scientific Coordinator: Prof. C. Sgarlata. Principal Investigator: Prof. C. De Stefano.
1st October 2018 - 30th September 2020: Member of the research team of the **ARCADIA project** (smARt materials for landfill leaChAte remeDIAtion), SSD CHIM/01, Analytical Chemistry. Scientific Coordinator: Prof. C. De Stefano.
22nd June 2020 – 30th April 2024: member of **COST Action** CA18202 – NECTAR (Network for Equilibria and Chemical Thermodynamics Advanced Research), supported by COST (European Cooperation in Science and Technology), participating in Working Groups WG2 (NECTAR for strong and/or multifunctional ligands, macromolecules, polyelectrolytes) and WG3 (NECTAR for multicomponent solutions and complex matrices). Coordinator: Prof. D. Milea.

PARTICIPATION IN RESEARCH AGREEMENTS

1st October 2018: **co-responsible of the research agreement** "Speciation Studies on: Determination of the Stability Constants of the Simple and Mixed Systems" between the Department of Chemical, Biological, Pharmaceutical and Environmental Sciences, University of Messina and The Procter & Gamble Company.

PROFESSIONAL MEMBERSHIPS

Since 26th April 2014: member of the Order of Chemists of Calabria, now the Order of Chemists and Physicists of Calabria, Register of Chemists and Physicists of Reggio Calabria, Section A, membership no. 651.
Since 18th April 2014: member of the Analytical Chemistry Division, Sicily Section, of the Italian Chemical Society, membership no. 19665.
Since 24th January 2022: member of the Environmental and Cultural Heritage Chemistry Division of the Italian Chemical Society.

PARTICIPATION IN COMMITTEES

Messina (Italy), 13st September 2026

Member of Examination Boards at University of Messina

A. Y. 2019/2020–2023/2024 and 2025/2026: Environmental Chemistry (SSD CHEM-01/B, formerly CHIM/12) and Chemistry for Cultural Heritage (SSD CHEM-01/B, formerly CHIM/12) within the Bachelor's Degree Program in Chemistry.
A. Y. 2022/2023 - Present: Chair of the Examination Board for the course Characterization and Management of Wastewater and Waste (SSD CHEM-01/B, formerly CHIM/12) within the Master's Degree Program in Chemistry.
A. Y. 2022/2023–2023/2024 and 2025/2026: Environmental Monitoring (SSD CHEM-01/B, formerly CHIM/12; also serving as substitute member on 27th November 2024) and Remediation and Characterization of Contaminated Sites (SSD CHEM-01/B, formerly CHIM/12) within the Master's Degree Program in Chemistry.
A. Y. 2022/2023 and 2023/2024: Principles of Environmental Chemistry (SSD CHIM/12) within the Degree Program in Sustainability and Environmental Innovation.
A. Y. 2022/2023 – Present: Chemistry of Aquatic Systems (SSD CHEM-01/B, formerly CHIM/12) within the Bachelor's Degree Program in Marine and Terrestrial Environmental Sciences (SMarT).
A. Y. 2023/2024: Chair of the Examination Board for the course Environmental Sciences (Ecology and Environmental Chemistry, BIO/07 and CHIM/12) within the Degree Program in Environmental and Workplace Prevention Techniques (TPALL).
A. Y. 2024/2025 - present: Analytical Methodologies for Seawater Analysis (SSD CHEM-01/A, formerly CHIM/01) within the Bachelor's Degree Program in Marine Biology and Blue Biotechnologies.
A. Y. 2026/2027 - present: Clinical Analytical Chemistry (SSD CHEM-01/A, formerly CHIM/01) within the Master's Degree Program in Chemistry.

UNIVERSITY TEACHING ACTIVITIES

Teaching Assignments at the University of Messina

A. Y. 2022/2023, 2023/2024, 2024/2025 and 2025/2026: **Characterization and Management of Wastewater and Waste** (6 ECTS; 36 contact hours per academic year; SSD CHEM-01/B, formerly CHIM/12) within the analytical-environmental curriculum of the Master's Degree Program in Chemistry.
A. Y. 2023/2024: **Environmental Chemistry** module (3 ECTS; 18 contact hours; SSD CHIM/12) within the course Environmental Sciences (Ecology and Environmental Chemistry), Degree Program in Environmental and Workplace Prevention Techniques (TPALL).
A. Y. 2024/2025: **Teaching Methodologies Laboratory for Environmental Chemistry** (1 ECTS; 12 contact hours; SSD CHEM-01/B, formerly CHIM/12) within the initial teacher education and qualification pathways for secondary-school teachers (Class B012 – Laboratory of Chemical and Microbiological Sciences and Technologies), established under Prime Ministerial Decree of 4th August 2023 (60-ECTS and 30-ECTS pathways).

SUPPLEMENTARY TEACHING ACTIVITIES

Subject Expert (Cultore della Materia)

1st October 2019 - 30th September 2022: Environmental Chemistry (SSD CHIM/12) at the Department of Chemical, Biological, Pharmaceutical and Environmental Sciences.
1st October 2021 - 30th September 2024: Analytical Chemistry (SSD CHIM/01) at the Department of Chemical, Biological, Pharmaceutical and Environmental Sciences.

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Tutoring and Student Guidance Activities

A. Y. 2015/2016: **tutor** during laboratory activities organised within the framework of the Scientific Degree Project (PLS) – Chemistry.
20th May 2016 – 31st October 2016: 120 hours of **specialised academic tutoring** within the project "Enhancement of Knowledge for Admission to Degree Programs with Restricted Access", Faculty of Science and Technology.
18th and 22nd July 2016: **teaching support activities** within UniMe Summer Orientation Campus, organised by the Orientation and Placement Centre of the University of Messina.
3rd – 25th November 2016: 54 hours of **information tutoring** at the Faculty of Science and Technology.
A. Y. 2018/2019, 2020/2021, 2021/2022: total 180 hours of **specialised chemistry tutoring** at the Department of Information Engineering, Infrastructure and Sustainable Energy, .
24th March 2022, 10th February 2023: two hours **of tutoring for Sicilian upper-secondary-school students** within the Chemistry Olympiad Training Programme, organised by the Sicilian Section of the Italian Chemical Society.
21st February and 6th March 2024: 8 hours of **laboratory activities** within the INTERDEPARTMENTAL UNIME PCTO programme for students from a Technical Industrial Institute in Acireale.
9th July 2024: 9 hours of **laboratory activities** within the project "Consapevolmente" for students from a Technical Industrial Institute in Acireale (Italy).

Seminar Activities

Seminar Lecturer at the University of Messina

A. Y. 2021/2022: in courses of Environmental Chemistry (2 hours, SSD CHIM/12, Course Lecturer: Prof. P. Cardiano) and Chemistry for Cultural Heritage (2 hours, SSD CHIM/12, Course Lecturer: Prof. P. Cardiano) in the Degree Program in Chemistry.
19th October 2022: 1-hour seminar entitled "Clean Water for Everybody: The Second Life of Blue Gold" during the UniMe Sustainability Day 2022, organized by the within the framework of the 2022 Festival for Sustainable Development.
13th January 2023: 2-hour invited seminar entitled "HypNMR: How to Calculate Equilibrium Constants Using NMR Data" within the course Organic Materials Chemistry Laboratory of the Master's Degree Programme in Chemistry, (Course Lecturer: Prof. G. Gattuso).
13th December 2023: 2-hour invited seminar entitled "HypNMR: How to Calculate Equilibrium Constants Using NMR Data" within the course Organic Materials Chemistry Laboratory of the Master's Degree Programme in Chemistry, (Course Lecturer: Prof. G. Gattuso).
5th February 2024: 1-hour seminar entitled "Clean Water for All: The Second Life of Blue Gold" within the INTERDEPARTMENTAL UNIME PCTO Programme (Academic Year 2023/2024) at the L. da Vinci Scientific High School, Reggio Calabria.
11th December 2024: 2-hour invited seminar entitled "HypNMR: How to Calculate Equilibrium Constants Using NMR Data" within the course Organic Materials Chemistry Laboratory of the Master's Degree Programme in Chemistry, (Course Lecturer: Prof. G. Gattuso).
11th, 13th December 2024: 4 hours of seminar activities within the course Remediation and Characterization of Contaminated Sites (SSD CHIM/12) of the Master's Degree Programme in Chemistry, (Course Lecturer: Prof. C. Bretti).
18th February 2025: 1-hour seminar entitled "Clean Water for Everybody: The Second Life of Blue Gold" within the PCTO project "Science for Human and Planetary Health" (2024/2025) at the L. da Vinci Scientific High School, Reggio Calabria.

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10th December 2025: 2-hour invited seminar entitled “HypNMR: How to Calculate Equilibrium Constants Using NMR Data” within the course Organic Materials Chemistry Laboratory of the Master’s Degree Programme in Chemistry, (Course Lecturer: Prof. G. Gattuso).
10th December 2025: 2 hours of seminar activities within the course Remediation and Characterization of Contaminated Sites (SSD CHEM-01/B, formerly CHIM/12) of the Master’s Degree Programme in Chemistry, (Course Lecturer: Prof. C. Bretti).

Teaching Support During Laboratory Classes

A.Y. 2022/2023: 1 ECTS credit, 12 hours within the course **Principles of Environmental Chemistry** (SSD CHIM/12, Course Lecturer: Prof. C. Bretti) in the Degree Programme in Sustainability and Environmental Innovation, .
A. Y. 2022/2023: 1 ECTS credit, 12 hours within the course **Characterization and Quality Control Technologies** (SSD CHIM/01, Course Lecturer: Prof. Carla De Stefano) in the Master’s Degree Programme in Chemistry.
A. Y. 2023/2024: 1 ECTS credit, 12 hours within the course **Principles of Environmental Chemistry** (SSD CHIM/12, Course Lecturer: Prof. C. Bretti) in the Degree Programme in Sustainability and Environmental Innovation.

Supervisor and Co-supervisor of Degree Theses

A. Y. 2021/2022: **co-supervisor** of the experimental Master’s Degree thesis in Chemistry entitled “Preparation of Novel Adsorbent Materials for the Sequestration of Cd(II) from Bergamot Processing Waste”. Student: S.G.M.R.; Supervisor: Prof. G. Lando.
A. Y. 2021/2022: **co-supervisor** of the experimental Master’s Degree thesis in Chemistry entitled “Hydrolytic Behaviour of Metals in Natural and Biological Fluids”. Student: A.C.; Supervisor: Prof. R.M. Cigala.
A. Y. 2021/2022: **co-supervisor** of the experimental Bachelor’s Degree thesis in Chemistry entitled “Acid-Base Properties and Sequestering Ability of Gallic Acid Towards Cd^{2+}, CH_3Hg^+ and $(CH_3)_2Sn^{2+}$”. Student: S.S.; Supervisor: Prof. Paola Cardiano.
A. Y. 2023/2024: **co-supervisor** of the experimental Master’s Degree thesis in Chemistry entitled “Thermodynamic Study of the Interaction Between trans-Aconitic Acid and Metal Cations of Biological and Environmental Interest”. Student: V.A.; Supervisor: Prof. C. Bretti.
A. Y. 2024/2025**: supervisor** of the experimental Master’s Degree thesis in Chemistry entitled “Gallic Acid: A Polyphenolic Compound for the Sequestration of Metal Cations Contaminating Natural Waters”. Student: E.V.; Co-supervisor: Prof. R.M. Cigala.
A. Y. 2025/2026 – present: **assignment** of a Master’s Degree thesis in Chemistry, Student: V.B. (Request Protocol No. 170468 of 12 December 2025, Ref. 2025-UNMECLE-0170468).

Supervision of PhD Students

1st November 2022 – 30th September 2025**: co-supervisor** of PhD candidate S.G.M.R. for the project “Biobased Materials for the Removal of Water Contaminants”, under the supervision of Prof. Carla De Stefano, PhD Programme in Chemical Sciences, XXXVIII Cycle, .
13th January 2026 – 29th May 2026: **supervisor** of PhD student K.E. within the international mobility project TNE23-00049 MARE (Mediterranean Alliance for Research and Education). Research topic: “Biochar Production from Olive Mill Waste for Wastewater Treatment and Environmental Applications” (acceptance letter Protocol No. 0174270 of 18 December 2025), Department of Chemical, Biological, Pharmaceutical and Environmental Sciences, . Project Coordinator: Prof. A. Germanà.

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RESEARCH FUNDING

2st August 2022: **extraordinary research grant** (€1,000.00) awarded by the Board of Directors of the (Protocol No. 0100902 of 5th August 2022) to support publication of the review article "Lipids in Archaeological Pottery: A Review on Their Sampling and Extraction Techniques" in Molecules (Impact Factor 4.6), published by MDPI (Basel, Switzerland).
28th December 2022: **University Research Basic Activities Funds** (FFABR UniMe 2022) (€1,500.00; Protocol No. 168838 of 28 December 2022) awarded by the in support of basic research activities.
25th March 2026: **University Research Basic Activities Funds** (FFABR UniMe 2025) (€1,500.00; Protocol No. 0040247 of 25th March 2026) awarded by the in support of basic research activities.

LANGUAGE SKILLS

Excellent skills written and spoken English, demonstrated by the following language certifications:
26th April 2005: Preliminary English Test (PET), CEFR Level B1.
14th July 2018: First Certificate in English (FCE), CEFR Level B2.

DIGITAL SKILLS

Extensive experience in the use of computational software for determining thermodynamic parameters of complex species formation and performing speciation studies in multicomponent systems, including BSTAC4, STACO4, LIANA, Hyperquad, HypSpec, and HypNMR, applied to a variety of analytical techniques such as potentiometry, voltammetry, UV-Vis spectrophotometry, spectrofluorimetry, and ^{1}H NMR spectroscopy.
Advanced proficiency in: Microsoft Word, Microsoft Excel, Microsoft PowerPoint, Internet Explorer, Microsoft Outlook, Online collaboration platforms, supported by the following certifications:
12th July 2010: European Computer Driving Licence (ECDL Core).
23rd February 2015: ECDL IT Security – Specialized Level and New ECDL (ECDL Base, ECDL Standard, and ECDL Full Standard).
18th December 2018: Renewal of the ECDL Full Standard certification.
Good working knowledge of DOS, Microsoft Access, Microsoft Publisher, ChemDraw, MestreNova.

SCIENTIFIC ACTIVITY

Research Interests

A substantial part of Anna Irto's scientific activity is devoted to speciation studies of metal and organometallic cations, as well as ligands of different nature (organic, inorganic, commercial products, and synthetic compounds) characterized by low, medium, or high molecular weight and of environmental and biological relevance. The aim of these studies is to identify and quantify the different chemical forms in which a component may occur within real multicomponent systems, such as natural waters (freshwater, seawater, rainwater) and biological fluids (blood plasma, urine, saliva). Within this research area, Dr. Irto focuses on the determination of thermodynamic parameters related to protonation, hydrolysis, and complex formation in binary and ternary aqueous systems through the use of electrochemical techniques (potentiometry and voltammetry), spectro(photo)metric techniques (UV-Vis spectroscopy, spectrofluorimetry, ^{1}H NMR, and ESI-MS), and calorimetric methods. In addition, ^{1}H NMR spectroscopy and computational calculations are employed to gain insight into metal-ligand coordination, while thermogravimetric analysis provides information on the stoichiometry and thermal stability of the species formed within the investigated systems. Experimental measurements are frequently carried out under different pH and temperature conditions in NaCl ionic media, the principal inorganic constituent of many of the systems under investigation. To reproduce natural conditions as closely as possible, speciation studies are often performed at ionic strengths representative of real systems (e.g., freshwater, seawater, hypersaline waters, water for industrial purposes, blood plasma). Particular attention is also devoted to the determination of activity coefficients of dissolved species and to

modeling their dependence on ionic medium, ionic strength, and temperature through different theoretical approaches, including the Extended Debye-Hückel, SIT, Pitzer, and van't Hoff equations.These studies are of fundamental importance in environmental sciences because they provide information on the potential toxicity and environmental impact of different chemical species and support the design and optimization of remediation strategies for contaminated sites. In the technological and industrial sectors, such investigations contribute to the development of new products and the improvement of existing ones. In biological and pharmaceutical sciences, they provide a basis for selective removal of undesirable species from biological systems and for controlled drug delivery applications. Research periods carried out at the Universidade de Lisboa (Portugal) and the Friedrich Schiller University Jena (Germany) enabled Dr. Irto to acquire extensive expertise in the design, synthesis, purification, and characterization of novel chelating agents, including 3-hydroxy-4-pyridinones and metallophores such as aminochelin, azotochelin, and protochelin, using ^{1}H and ^{13}C NMR spectroscopy and ESI-MS. These synthesized compounds were subsequently employed in aqueous speciation studies involving potentially toxic metal cations and in the evaluation of their effectiveness for metal removal from environmental and biological matrices.

Parallel to these investigations, the research activity also focuses on the synthesis, characterization, and performance evaluation of innovative eco-sustainable materials for the conservation of stone materials of historical and artistic interest, as well as for environmental applications. The developed materials consist of Bisphenol A (BPA)-free epoxy resins, since BPA has been demonstrated to cause endocrine system alterations in humans. Through sol-gel technology, these resins can be compatibilized with inorganic matrices using differently functionalized alkylalkoxysilanes, producing hybrid materials whose chemical, physical, and thermal properties can be tailored to obtain composites with specific functionalities while avoiding the drawbacks associated with BPA-based precursors.

Anna Irto has also conducted research in the field of archaeometry. In particular, she participated in investigations on mosaic tesserae recovered from the archaeological site of Villa San Pancrazio in Taormina, which includes two Roman Imperial-age domus. The study combined non-destructive analytical techniques, such as X-ray fluorescence (XRF) and Raman spectroscopy, with micro-destructive techniques such as X-ray diffraction (XRD), together with a statistical approach based on Principal Component Analysis (PCA). The objective was to support archaeological investigations by providing information on raw materials and manufacturing technologies employed in tessera production.

Additional research interests concern the analysis of lipidic organic residues, including triglycerides, diglycerides, fatty acids, and volatile compounds, derived from food, balms, and perfumes preserved in archaeological ceramic artifacts such as amphorae, jars, jugs, and unguentaria dating back to the Late Roman Imperial period. Analytical investigations are performed using liquid and gas chromatography coupled with mass spectrometry (HPLC-MS and GC-MS). Volatile compounds are extracted by headspace solid-phase microextraction (HS-SPME), while quantitative analyses are carried out by evaporative light scattering detection (ELSD) and flame ionization detection (FID). In this context, artificial ageing studies were conducted on triglycerides (triolein, trilinolein, and tristearin) and on real extra virgin olive oil samples originating from different cultivars and production regions of Italy and Spain. Through multivariate chemometric approaches based on PCA, the research aimed at identifying possible "archaeological biomarkers", namely oxidative degradation products capable of providing information on both the origin of organic residues and the types of ceramic containers in which they were preserved.

Another major research line concerns the production, characterization, and reuse of environmentally friendly multifunctional materials obtained from agri-food waste biomass, within the framework of Mission 2 "Green Revolution and Ecological Transition", Component 1 "Circular Economy and Sustainable Agriculture" (M2C1) of the Italian National Recovery and Resilience Plan (PNRR), Green Chemistry and 2030 Agenda for Sustainable Development. Investigated biomasses include bergamot, olive and grape poamce, subjected to chemical or thermal pretreatments. Particular attention is devoted to studying the sequestration capacity of the active sites present in these materials under different pH and ionic strength conditions towards metallic and pharmaceutical contaminants in natural and waste-waters, from multicomponent aqueous solutions and real

matrices including acid mine drainage. Material characterization is performed through potentiometry, FT-IR ATR and Raman spectroscopy, HPLC, electron microscopy (SEM-EDX and TEM), thermogravimetric analysis (TGA), BET porosimetry, and dynamic light scattering (DLS), while metal uptake is assessed by ICP-OES. Research activities also include the experimental determination of adsorption enthalpies through isothermal titration calorimetry (ITC) and the identification and quantification of high-value compounds (polyphenols and coumarins) for their potential recovery from washing waters generated during biomass pretreatment. Hydrothermal synthesis or pyrolysis performed under optimized experimental conditions (reaction time, temperature, and biomass concentration) also enables the production of Carbon Quantum Dots (CQDs) and biochar, versatile nanomaterials characterized by remarkable optical and photoluminescent properties that make them suitable for environmental sensing of metal cations and pharmaceuticals.
The scientific activity additionally includes the analysis of municipal solid waste landfill leachates as potential carries of metals along soil and aquifers, aimed at their comprehensive physicochemical and thermodynamic characterization through official methodologies established by Italian Legislative Decree 152/2006 and analytical techniques such as potentiometry, FT-IR ATR, voltammetry, SEM-EDX, XRD, and TGA. These studies also evaluate the potential reuse of leachates, within a circular economy perspective, as sequestering agents for potentially toxic metal cations in groundwater systems.

National and International Scientific Collaborations

Collaboration with Italian and international researchers is demonstrated by co-authored publications in international peer-reviewed journals, dissemination journals, and presentations at national and international conferences:
University of Messina, Italy (other research groups and departments)
University of Palermo, Italy
University of Catania, Italy
Sapienza University of Rome, Italy
University of Campania "Luigi Vanvitelli", Italy
University of Urbino Carlo Bo, Italy
University of Udine, Italy
University of Bologna, Italy
Universidade de Lisboa, Portugal
University of Debrecen, Hungary
University of the Basque Country (UPV/EHU), Spain
University of Mainz, Germany
Justus Liebig University Giessen, Germany
Universitat Politècnica de Catalunya, Spain
University of Cadi Ayyad, Marrakech, Morocco
Chromaleont S.r.l., Italy
Ambiente Lab. S.r.l., Messina, Italy
PH3 Engineering S.r.l., Messina, Italy
Institute for Archaeological and Monumental Heritage, National Research Council (CNR), Catania, Italy
Department for Sustainability (SSPT), ENEA, Rome, Italy
Cetaqua - Water Technology Centre, Spain

Scientific Publications

Between 2015 and 2026, Anna Irto authored:

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44 papers published in international peer-reviewed journals, 1 single-author article published in the journal of the Italian Chemical Society, La Chimica e l'Industria Online, 1 co-authored article published in the Shimadzu dissemination magazine, 87 contributions to national and international conferences, including: 1 invited 30-minute lecture in English, awarded in recognition of the Fernando Pulidori Prize at the International Symposium on Metal Complexes 2019 (ISMEC 2019); 13 oral communications; 2 flash communications in English.

Bibliometric Indicators

Scopus
Publications: 44, H-index: 14, Citations: 469.
Scopus Author ID: 56473656000, ORCID: 0000-0002-9023-2897.

PUBLICATIONS

Articles on ISI journals

[1] R. M. Cigala, C. De Stefano, **A. Irto**, D. Milea, S. Sammartano, Thermodynamic Data for the Modeling of Lanthanoid (III) Sequestration by Reduced Glutathione in Aqueous Solution, *J. Chem. Eng. Data*, 2015, 60 (*1*), 192-201, DOI: 10.1021/je500961u.

[2] F. Crea, C. De Stefano, **A. Irto**, D. Milea, A. Pettignano, S. Sammartano, Modeling the acid-base properties of molybdate(VI) in different ionic media, ionic strengths and temperatures, by EDH, SIT and Pitzer equations, *J. Mol. Liq.* 2017, 229, 15–26, DOI: 10.1016/j.molliq.2016.12.041.

[3] C. Bretti, R. M. Cigala, F. Crea, C. De Stefano, G. Gattuso, **A. Irto**, G. Lando, D. Milea, S. Sammartano, Thermodynamic properties of O-donor polyelectrolytes: determination of the acid-base and complexing parameters in different ionic media and temperatures, *J. Chem. Eng. Data* 2017, 62 (9), 2676–2688. DOI: 10.1021/acs.jced.7b00101.

[4] P. Cardiano, R. M. Cigala, F. Crea, F. Giacobello, O. Giuffrè, **A. Irto**, G. Lando, S. Sammartano, Sequestration of Aluminium(III) by different natural and synthetic organic and inorganic ligands in aqueous solution, *Chemosphere* 2017, 186, 535-545, DOI: 10.1016/j.chemosphere.2017.08.015.

[5] **A. Irto**, P. Cardiano, K. Chand, R. M. Cigala, F. Crea, C. De Stefano, L. Gano, S. Sammartano, M. A. Santos, Bifunctional 3-hydroxy-4-pyridinones as effective aluminium chelators: synthesis, solution equilibrium studies and in vivo evaluation, *J. Inorg. Biochem.* 2018, *186*, 116-129, DOI: 10.1016/j.jinorgbio.2018.05.017 (**primo nome**).

[6] C. Bretti, P. Cardiano, R. M. Cigala, C. De Stefano, **A. Irto**, G. Lando, S. Sammartano, Exploring Various Ligand Classes For The Efficient Sequestration Of Stannous Cations In The Environment, *Sci. Total Environ.* 2018, 643, 704-714, DOI: 10.1016/j.scitotenv.2018.06.241.

[7] **A. Irto**, P. Cardiano, K. Chand, R. M. Cigala, F. Crea, C. De Stefano, L. Gano, G. Gattuso, S. Sammartano, M. A. Santos, New bis-(3-hydroxy-4-pyridinone)-NTA-derivative: Synthesis, binding ability towards Ca^{2+}, Cu^{2+}, Zn^{2+}, Al^{3+}, Fe^{3+} and biological assays, *J. Mol. Liq.* 2018, 272, 609-624, DOI: 10.1016/j.molliq.2018.09.107 (**primo nome**).

[8] R. M. Cigala, F. Crea, C. De Stefano, **A. Irto**, S. Sammartano, Use of Gantrez copolymers as potential chelating agent for the selective sequestration of metal ions. Studies of the interactions in aqueous solution at different ionic strengths and temperatures, *J. Chem. Eng. Data* 2018, 643, 704-714, DOI: 10.1021/acs.jced.8b00655.

Messina (Italy), 13st September 2026

[9] **A. Irto**, P. Cardiano, K. Chand, R. M. Cigala, F. Crea, C. De Stefano, L. Gano, G. Gattuso, S. Sammartano, M. A. Santos, A new bis-(3-hydroxy-4-pyridinone)-DTPA-derivative: Synthesis, complexation of di-/tri-valent metal cations and in vivo M^{3+} sequestering ability, *J. Mol. Liq*. 2019, 281, 280-294, DOI: 10.1016/j.molliq.2019.02.042 (**primo nome**).

[10] **A. Irto**, P. Cardiano, S. Cataldo, K. Chand, R. M. Cigala, F. Crea, C. De Stefano, G. Gattuso, N. Muratore, A. Pettignano, S. Sammartano, M. A. Santos, Speciation studies of bifunctional 3-hydroxy-4-pyridinone ligands in the presence of Zn^{2+} at different ionic strengths and temperatures, *Molecules* 2019, *24*(22), 4084, DOI: 10.3390/molecules24224084 (**primo nome**).

[11] F. Crea, C. De Stefano, **A. Irto**, G. Lando, S. Materazzi, D. Milea, A. Pettignano, S. Sammartano, Understanding the solution behavior of epinephrine in the presence of toxic cations: Thermodynamic investigation in different experimental conditions, *Molecules* 2020, *25*(3), 511, DOI: 10.3390/molecules25030511.

[12] R. M. Cigala, F. Crea, C. De Stefano, **A. Irto**, D. Milea, S. Sammartano, Thermodynamic Behavior of Polyalcohols and Speciation Studies in the Presence of Divalent Metal Cations, *J. Chem. Eng. Data* 2020, *65*(5), 2805-2812, DOI: 10.1021/acs.jced.0c00120.

[13] R. M. Cigala, F. Crea, C. De Stefano, **A. Irto**, S. Sammartano, Nature as Resource. Thermodynamic characterization of natural and synthetic polymers and their sequestering ability towards some bivalent metal cations, *J. Chem. Thermodyn.* 2020, 150, 106205, DOI: 10.1016/j.jct.2020.106205.

[14] C. Bretti, P. Cardiano, **A. Irto**, G. Lando, D. Milea, S. Sammartano, Interaction of N-Acetyl-L-cysteine with Na^{+}, Ca^{2+}, Mg^{2+} and Zn^{2+}. Thermodynamic aspects, chemical speciation and sequestering ability in natural fluids, *J. Mol. Liq.* 2020, 319, 114164, DOI: 10.1016/j.molliq.2020.114164.

[15] **A. Irto***, P. Cardiano, K. Chand, R. M. Cigala, F. Crea, C. De Stefano, G. Gattuso, S. Sammartano, M. A. Santos, Complexation of environmentally and biologically relevant metals with bifunctional 3-hydroxy-4-pyridinones, *J. Mol. Liq.* 2020, 319, 114349, DOI: 10.1016/j.molliq.2020.114349 (**primo nome, *autore corrispondente**).

[16] O. Gómez-Laserna, P. Irizar, G. Lando, L. Kortazar, **A. Irto**, L. Ruiz-Rubio, I. Martinez-Arkarazo, P. Cardiano, M. Á. Olazabal, Design of Epoxy-Silica Hybrids Based on Cycloaliphatic Diol of Natural Origin for Conservation of Lithic Materials, *Prog. Org. Coat.* 2021, 151, 106028, DOI: 10.1016/j.porgcoat.2020.106028.

[17] A. Gigliuto, R. M. Cigala, **A. Irto**, M.R. Felice, A. Pettignano, D. Milea, S. Materazzi, C. De Stefano, F. Crea, The Solution Behavior of Dopamine in the Presence of Mono and Divalent Cations: A Thermodynamic Investigation in Different Experimental Conditions, *Biomolecules* 2021, 11*(9)*, 1312, DOI: 10.3390/biom11091312.

[18] F. Crea, A. Gigliuto, C. De Stefano; **A. Irto**, Behavior of Ofloxacin antibacterial in aqueous solution: Protonation constants, total and intrinsic solubility in $NaCl_{(aq)}$ at different temperatures, *J. Sol. Chem.* 2021, 50, 1236–1257, DOI: 10.1007/s10953-021-01114-2 (**ultimo nome**).

[19] C. Bretti, R. Di Pietro, P. Cardiano, O. Gómez-Laserna, **A. Irto**, G. Lando, C. De Stefano, Thermodynamic solution properties of a biodegradable chelant (L-glutamic-N,N-diacetic acid, L-GLDA) and its sequestering ability towards Cd^{2+}, *Molecules* 2021, 26(*23*), 7087, DOI: 10.3390/molecules26237087.

[20] **A. Irto***, P. Cardiano, K. Chand, R. M. Cigala, F. Crea, C. De Stefano, M. A. Santos*, Bifunctional 3-hydroxy-4-pyridinones as potential selective iron(III) chelators: solution studies and comparison with other metals of biological and environmental relevance, *Molecules* 2021*,* 26(*23*), 7280, DOI: 10.3390/molecules26237280 (**primo nome, *autore corrispondente**).

[21] O. Gómez-Laserna, **A. Irto**, P. Irizar, G. Lando, C. Bretti, I. Martinez-Arkarazo, L. Campagna, P. Cardiano, Non-invasive approach to investigate the mineralogy and production technology of the mosaic tesserae from the Roman domus of Villa San Pancrazio (Taormina, Italy), *Crystals* 2021, 11(*11*), 1423, DOI: 10.3390/cryst11111423.

[22] A. Gigliuto, R. M. Cigala, **A. Irto**, M.R. Felice, A. Pettignano, C. De Stefano, F. Crea, The effect of metal cations on the aqueous behavior of dopamine. Thermodynamic investigation of the binary and ternary interactions with Cd^{2+}, Cu^{2+} and UO_2^{2+} in NaCl at different ionic strengths and temperatures. *Molecules* 2021, 26(*24*), 7679, DOI: 10.3390/molecules26247679.

[23] M. A. Santos, **A. Irto**, P. Buglyó, S. Chaves, Hydroxypyridinone-based metal chelators towards ecotoxicity: remediation and biological mechanisms, *Molecules* 2022, 27(*6*), 1966, DOI: 10.3390/molecules27061966.

[24] **A. Irto***, G. Micalizzi*, C. Bretti, V. Chiaia, L. Mondello, P. Cardiano, Lipids in Archaeological Pottery: A Review on Their Sampling and Extraction Techniques, *Molecules* 2022, 27(11), 3451, DOI: 10.3390/molecules27113451 (**primo nome, *autore corrispondente**).

[25] P. Irizar, **A. Irto**, I. Martinez-Arkarazo, M. Á. Olazabal, P. Cardiano, O. Gómez-Laserna, Sugar-derived bio-based resins as platforms for the development of multifunctional hybrids with potential application for stone conservation, *Mater. Today Commun.* 2022, 31, 103662, DOI: 10.1016/j.mtcomm.2022.103662.

[26] R. M. Cigala, C. De Stefano, **A. Irto**, P. Lanzafame, G. Papanikolaou, F. Crea, Environmental behaviour of a pesticide metabolite, the AMPA. Sequestration of Ca^{2+}, Mg^{2+}, Cu^{2+}, Zn^{2+} and Al^{3+}, *Chemosphere* 2022, 306, 135535, DOI: 10.1016/j.chemosphere.2022.135535.

[27] F. Mancuso, D. Crisafulli, M. Milone, **A. Irto**, R. M. Cigala, G. Lando, I. Pisagatti, A. Notti, G. Gattuso, Tetracationic-to-dianionic tetraamino-dihydroxy-tetraoxacalix[4]arene: A paraquat receptor for all seasons, *J. Mol. Liq.* 2022, 368, 120670. DOI: 10.1016/j.molliq.2022.120670.

[28] **A. Irto**, R. M. Cigala, C. Alessandrello, C. De Stefano, G. Gattuso, F. Crea, Binary and ternary complexes of epinephrine with alginate and biologically and environmentally relevant metal cations, *Front. Chem.* 2023 (sezione Analytical Chemistry), 11:1189308. DOI: 10.3389/fchem.2023.1189308 (**primo nome**).

[29] **A. Irto**, F. Crea, C. Alessandrello, G. Gattuso, M. Cordaro, C. De Stefano, R. M. Cigala, Characterization of thermodynamic properties on Al^{3+}/dopamine system, *J. Mol. Liq.* 2023, 386, 122537. DOI: 10.1016/j.molliq.2023.122537 (**primo nome**).

[30] **A. Irto**, S. G. M. Raccuia, G. Lando, C. De Stefano, K. Arena, T. M. G. Salerno, A. Pettignano, F. Cacciola, L. Mondello, P. Cardiano, Valorization of citrus waste for circular economy: A case study on bergamot pomace as sorbent for Cd^{2+} removal and source of added value compounds, *Microchem. J.* 2023, 193, 109183. DOI: 10.1016/j.microc.2023.109183 (**primo nome**).

[31] **A. Irto**, R. M. Cigala, C. De Stefano, F. Crea, Advances in iron(III) hydrolysis studies. Effect of the metal concentration, ionic medium and ionic strength, *J. Mol. Liq.* 2023, 391, Part B, 123361. DOI: 10.1016/j.molliq.2023.123361 (**primo nome**).

[32] **A. Irto**, F. Crea, C. Alessandrello, C. De Stefano, R. Somma, G. Zaffino, S. Zaccaro, G. Papanikolaou, R. M. Cigala, Landfill leachate from Municipal Solid Waste: multi-technique approach for its fine characterization and determination of the thermodynamic and sequestering properties towards some toxic metals, *Sci. Total Environ.* 2024, 917, 170311, DOI: 10.1016/j.scitotenv.2024.170311 (**primo nome**).

[33] **A. Irto**, F. Crea, M. Milone, G. Gattuso, C. Bretti, C. De Stefano, R. M. Cigala, Deferiprone: new environmental perspectives. Insights into its sequestering ability vs. different metal cations, *Ecotoxicol. Environ. Saf.* 2024, 272, 116027, DOI: 10.1016/j.ecoenv.2024.116027 (**primo nome**).

[34] S. Previti, R. Ettari, E. Calcaterra, M. Roggia, B. Natale, A.C. Weldert, C. Müller, F. Salisch, **A. Irto**, R. M. Cigala, J. Ziebuhr, T. Schirmeister, S. Cosconati, M. Zappalà, Identification of promising dual inhibitors targeting the main protease (Mpro) and human cathepsin L as potential anti-SARS-CoV-2 agents, *ACS Med. Chem. Lett.* 2024,15(*5*), 602–609, DOI: 10.1021/acsmedchemlett.3c00562.

[35] V. Chiaia, G. Micalizzi, D. Donnarumma, **A. Irto**, C. Bretti, M. Venuti, G. Lando, L. Mondello, P. Cardiano, Study of oxidation products in aged olive oils by GC and HPLC techniques coupled to mass spectrometry to discriminate olive oil lipid substances in archaeological artifacts from ancient Taormina (Italy), *J. Chromatogr. A* 2024, 173130, 465154, DOI: 10.1016/j.chroma.2024.465154.

[36] M. Mazzaferro, D. Crisafulli, F. Mancuso, M. Milone, F. Puntoriero, **A. Irto**, S. Patanè, V. Greco, A. Giuffrida, I. Pisagatti, A. Notti, M. F. Parisi, G. Gattuso, A pillar[5]arene-based three-component supramolecular copolymer for the fluorescence detection of spermine, *Org. Chem. Front.* 2024, 11, 6293-6303, DOI: 10.1039/d4qo01470g.

[37] R. M. Cigala, S. G. M. Raccuia, C. Bretti, P. Cardiano, G. Lando, O. Gómez Laserna*, G. Gattuso, **A. Irto***, F. Crea, C. De Stefano, Gallic Acid as Potential Sequestering Agent for Methylmercury(II) and Dimethyltin(IV) Removal from Aqueous Solutions, *J. Environ. Chem. Eng.* 2024, 12, 114620, DOI: 10.1016/j.jece.2024.114620 (***autore corrispondente**).

[38] S. G. M. Raccuia, E. Zanda, C. Bretti, M. Formica, E. Macedi, A. Melchior, M. Tolazzi, M. Sanadar, D. Lascari, G. De Luca, **A. Irto***, C. De Stefano, P. Cardiano*, G. Lando, Multianalytical approach for the acid-base, thermal and surface properties assessment of waste biomasses, *Molecules* 2024, 29, 5735, DOI: 10.3390/molecules29235735 (***autore corrispondente**).

[39] R. M. Cigala, G. Savoca, C. Bretti, F. Crea, C. De Stefano, G. Gattuso, **A. Irto**, Binary and ternary interactions of Gantrez™ AN-169 with epinephrine and copper(II) in NaCl aqueous solution: Thermodynamic approach and simulations in real conditions, *J. Mol. Liq.* 2025*,* 4171, 126680, DOI: 10.1016/j.molliq.2024.126680 (**ultimo nome**).

[40] G. Lando, C. Bretti, P. Cardiano, **A. Irto**, D. Milea, C. De Stefano, A comprehensive equilibrium analysis of Tartronate with proton and major cations in natural fluids, *Molecules* 2025, 30(7), 1497, DOI: 10.3390/molecules30071497.

[41] **A. Irto**, I. Ielo, C. Bretti, F. Crea, C. De Stefano, R. M. Cigala, Ligands of Biological and Environmental Interest as Sequestering Agents for Fe^{3+} in Aqueous Solution: A Speciation Study

of Natural Fluids, *Molecules* 2025, 30(14), 2991, DOI: 10.3390/molecules30142991 (**primo nome**).

[42] E. Zanda, **A. Irto**, S. G. M. Raccuia, C. Bretti, G. De Luca, I. Ielo, M. Zoccali, A. Arena, G. Paladini, F. Caridi, M. Formica, E. Macedi, V. Venuti, C. De Stefano, L. Mondello, P. Cardiano, G. Lando, Optimisation of the quantum yield of carbon quantum dots prepared from bergamot pomace by means of a full factorial experimental design, *J. Environ. Chem. Eng.* 2025*,* 13(*5*), 118472, DOI: 10.1016/j.jece.2025.118472.

[43] S. G. M. Raccuia, E. Zanda, C. Bretti, M. Formica, E. Macedi, A. Melchior, M. Tolazzi, A. Pettignano, N. Muratore, D. Lascari, E. Teresi, C. Chiavetta, G. De Luca, **A. Irto**, C. De Stefano, P. Cardiano, G. Lando, Sustainable Recovery of Rare Earth Elements from Aqueous Media Using Fruit Pomaces: Adsorption Performance, Thermodynamics, and Environmental Assessment, *J. Ind. Engin. Chem.* 2025, in press, DOI: 10.1016/j.jiec.2025.09.008.

[44] **A. Irto**, R. Cappai, A. Amadeo, M. Peana, G. Cassone, C. De Stefano, C. Bretti, Exploring the Speciation of trans-Aconitic Acid in Aqueous Solution: Interactions with Divalent Metal Cations of Environmental Relevance, ACS Omega 2026, 11, 19, 28737-28749, DOI: 10.1021/acsomega.6c01283.

- **Article on Journal of Italian Chemical Society**

[I] **A. Irto**, NEW M-CHELATING AGENTS WANTED! La Chimica e l'Industria online, January/February **2020,** year IV, 1, 54-57. ISSN 2283-544X, DOI: 10.17374/CI.2020.102.1.54.

- **Invited Oral Presentations at International Conferences**

[C1] **A. Irto**, P. Cardiano, K. Chand, R. M. Cigala, F. Crea, C. De Stefano, G. Gattuso, S. Sammartano, M. A. Santos, Thermodynamic parameters for the M^{2+}/bifunctional 3-hydroxy-4-pyridinones complex formation at different experimental conditions. *International Symposium on Metal Complexes 2019 (ISMEC 2019)*. (Pulidori lecture 1**)**. Debrecen (Ungheria), 11-14/06/2019.

- **Oral Presentations at National and International Conferences as Presenting Author**

[C2] C. Bretti, R. M. Cigala, C. De Stefano, **A. Irto**, G. Lando, S. Sammartano: Parametri termodinamici di formazione di complessi dell'Al^{3+} con leganti O-donatori. *Convegno Congiunto Sezioni Calabria e Sicilia della Società Chimica Italiana.* Contributo O16. Catanzaro (CZ), 03-04/12/2015.

[C3] K. Chand, R. M. Cigala, **A. Irto**, F. Crea, C. De Stefano, S. Sammartano, M. A. Santos: 3-hydroxy-4-piridinone derivatives: synthesis, acid - base properties and interactions with Al^{3+}. *XXVI Congresso Nazionale della Divisione di Chimica Analitica della Società Chimica Italiana*. Contributo EQUI-4. Giardini Naxos (ME), 18-22/09/2016.

[C4] **A. Irto**, P. Cardiano, K. Chand, R. M. Cigala, F. Crea, C. De Stefano, S. Sammartano, M. A. Santos: Studio di speciazione di un legante 3-idrossi-4-piridinonico in presenza di un catione metallico di interesse biologico*. Congresso Congiunto delle Sezioni Sicilia e Calabria della Società Chimica Italiana 2019*. Contributo OC13. Palermo (PA), 01-02/03/2019.

[C5] **A. Irto**, P. Cardiano, K. Chand, R. M. Cigala, F. Crea, C. De Stefano, S. Sammartano, M. A. Santos, Acid-base properties and binding ability of an aspartic acid derivative of 3-hydroxy-4-pyridinone

towards biological relevant metal cations. *XXVIII Congresso della Divisione di Chimica Analitica della Società Chimica Italiana*. Contributo O3 SES1. Bari (BA), 22-26/09/2019.

[C6] **A. Irto**, P. Cardiano, K. Chand, R. M. Cigala, F. Crea, C. De Stefano, M. A. Santos, Thermodynamic parameters on the interaction of divalent and trivalent metal cations with 3-hydroxy-4-pyridinones, *XXVII Congresso Nazionale della Società Chimica Italiana*, Contributo ANAOR091. Piattaforma Ibrida.io, 14-23/09/2021.

[C7] **A. Irto**, P. Cardiano, K. Chand, R. M. Cigala, F. Crea, C. De Stefano, M. A. Santos, 3-Hydroxy-4-Pyridinone as Potential Chelating Agent for the Remediation of Ecotoxic Metals from Environmental Matrices, *21st European Meeting on Environmental Chemistry (EMEC21)*. Novi Sad (Serbia), 30/11-03/12/2021.

[C8] **A. Irto**, V. Chiaia, G. Micalizzi, D. Donnarumma, C. Bretti, C. De Stefano, P. Cardiano, L. Mondello, COMPREHENSIVE CHARACTERIZATION OF AGED LIPIDS BY USING CHROMATOGRAPHIC ANALYTICAL TECHNIQUES COUPLED TO MASSS PECTROMETRY DETECTION, *XIX National Congress of the Environmental and Cultural Heritage Division of the Italian Chemical Society*. Contributo OP13, Torino (Italia), 20-23/06/2022.

[C9] **A. Irto**, O. Gómez-Laserna, G. Lando, C. De Stefano, P. Cardiano, BERGAMOT PASTAZZO AS SUSTAINABLE PLATFORM FOR Cd^{2+} REMOVAL FROM AQUEOUS SOLUTION, *XXIX Congresso della Divisione di Chimica Analitica della Società Chimica Italiana.* Contributo AMB-OR13. Milazzo (ME), 11-15/09/2022.

[C10] **A. Irto**, G. Lando, C. De Stefano, P. Cardiano, Bergamot Pastazzo as Suitable Platform for Cd^{2+} Removal and Sensing in Multicomponent Aqueous Solutions, *22nd European Meeting on Environmental Chemistry (EMEC22)*. Lubiana (Slovenia), 05-08/12/2022.

[C11] **A. Irto**, S. G. M. Raccuia, R. M. Cigala, C. Bretti, O. Gómez-Laserna, P. Cardiano, C. De Stefano, F. Crea, GALLIC ACID FOR THE SEQUESTRATION OF ORGANOMETALS IN AQUEOUS SOLUTIONS, *XXX Congresso della Divisione di Chimica Analitica della Società Chimica Italiana*. Contributo O8-Eq. Vasto (CH), 17-21/09/2023.

[C12] **A. Irto**, S. G. M. Raccuia, R. M. Cigala, C. Bretti, O. Gómez-Laserna, P. Cardiano, F. Crea, C. De Stefano, Gallic acid for the sequestration of Cd^{2+} and Pb^{2+} in aqueous solutions, *XXVIII Congresso Nazionale della Società Chimica Italiana*, Contributo ANA-OR-036, Milano, 26-30/08/2024.

[C13] **A. Irto**, C. Bretti, P. Cardiano, R. M. Cigala, F. Crea, G. Lando, S. G. M. Raccuia, C. De Stefano, A natural polyphenol as a green M^{2+} chelating agent in environmental and industrial matrices, *XXXII Congresso Nazionale della Divisione di Chimica Analitica della Società Chimica Italiana,* Contributo O-ABC-11, Venezia, 6-10/09/2026.

- **Flash Communications at National and International Conferences as Presenting Author**

[C14] P. Cardiano, K. Chand, R. M. Cigala, F. Crea, C. De Stefano, G. Gattuso, **A. Irto**, S. Sammartano, M. A. Santos: Speciation study of a bis-(3-hydroxy-4-pyridinone) towards M^{2+}. *XXVII Congresso della Divisione di Chimica Analitica della Società Chimica Italiana.* Flash Communication in lingua inglese + Presentazione Poster (F2-EQ). Bologna (BO), 16-20/09/2018.

Messina (Italy), 13st September 2026

[C15] **A. Irto,** P. Cardiano, K. Chand, R. M. Cigala, F. Crea, C. De Stefano, M. A. Santos, Speciation studies of bifunctional alkyl-(amino-carboxylic)-3- hydroxy-4-pyridinones in the presence of Fe^{3+}, *International Symposium on Metal Complexes 2021 (ISMEC 2021)*. Flash Communication in lingua inglese + Presentazione Poster (P28). Microsoft Teams, 16-18/06/2021.

- **Poster Presentations at National and International Conferences as Corresponding Author**

[C16] P. Cardiano, C. Foti, O. Giuffrè, **A. Irto**, D. Milea: Sequestering ability of Diethylenetriamine-N,N,N',N'',N''-pentakis-(methylene phosphonic acid) towards alkyltin(IV) compounds. *XXVI Congresso Nazionale della Divisione di Chimica Analitica della Società Chimica Italiana*. Contributo P95. Giardini Naxos (ME), 18-22/09/2016.

[C17] K. Chand, R. M. Cigala, F. Crea, C. De Stefano, **A. Irto**, S. Sammartano, M. A. Santos: Speciazione di bis-3-idrossi-4-piridinoni in presenza di cationi metallici bivalenti e trivalenti. *Workshop delle Sezioni Sicilia e Calabria della Società Chimica Italiana 2016-2017*. Contributo P-16. Messina (ME), 09-10/02/2017.

[C18] **A. Irto**, K. Chand, R. M. Cigala, F. Crea, L. Gano, C. De Stefano, S. Sammartano, M. A. Santos: Bis-3-hydroxy-4-pyridinones: From the synthesis to the complexation with Al^{3+} and Fe^{3+} and the biological assays. *International Symposium on Metal Complexes 2017 (ISMEC 2017)*. Contributo P 40. Dijon (Francia), 11-15/06/2017.

[C19] F. Crea, C. De Stefano, **A. Irto**, S. Sammartano. Speciation of Al^{3+} in the presence of ligands of industrial, biological and environmental interest. *XXVI Congresso Nazionale della Società Chimica Italiana 2017*. Contributo ANA-PO32. Paestum (SA), 10-14/09/2017.

[C20] **A. Irto**, P. Cardiano, K. Chand, R. M. Cigala, F. Crea, C. De Stefano, S. Sammartano, M. A. Santos: Binding ability of bifunctional 3-hydroxy-4-pyridinone ligands towards divalent metal cations of biological interest. *International Symposium on Metal Complexes 2018 (ISMEC 2018)*. Contributo P 23. Firenze (FI), 03-07/06/2018.

[C21] P. Irizar, O. Gómez-Laserna, **A. Irto**, G. Lando, C. Bretti, R. M. Cigala, I. Martinez-Arkarazo, M. Á. Olazabal, P. Cardiano, A novel spectroscopical approach to assess the synthesis and characterization of BPA-free epoxy resins designed for stone conservation. *Workshop Functional Materials for Cultural Heritage (Fun4Heritage) 2019*. Contributo P6. Matera (MT), 05-06/09/2019.

[C22] **A. Irto**, P. Cardiano, K. Chand, R. M. Cigala, F. Crea, S. Sammartano, M. A. Santos, Capacitá complessante e sequestrante di 3-idrossi-4-piridinoni nei confronti di un catione metallico di interesse biologico, *Workshop della Sezione Sicilia della Società Chimica Italiana 2020*. Contributo P18. Microsoft Teams, 03/12/2020.

[C23] **A. Irto**, S. G. M. Raccuia, K. Arena, T. M. G. Salerno, G. Lando, P. Cardiano, F. Cacciola, L. Mondello, Determinazione di composti ad alto valore aggiunto da scarti di lavorazione del bergamotto. *CONVEGNO CONGIUNTO SEZIONI CALABRIA E SICILIA DELLA SOCIETÀ CHIMICA ITALIANA (SCICaSi) 2022*. Contributo P19. Reggio Calabria, 01-02/12/2022.

[C24] **A. Irto**, G. Lando, P. Cardiano, C. De Stefano, C. Bretti, Thermodynamic Solution Properties of Trans-Aconitic acid and Its Sequestering Ability toward Cd^{2+}, Pb^{2+} and Mn^{2+} at different experimental

conditions. *22nd European Meeting on Environmental Chemistry (EMEC22)*. Lubiana (Slovenia), 05-08/12/2022.

[C25] **A. Irto**, R. M. Cigala, S. G. M. Raccuia, C. Bretti, P. Cardiano, G. Lando, O. Gómez Laserna, G. Gattuso, F. Crea, C. De Stefano, Sequestration of metal and organometal cations using a natural occurring polyphenol, *Congresso Congiunto delle Sezioni Sicilia e Calabria 2024 della Società Chimica Italiana (SciSiCa)*, Presentazione Poster PO24, Messina, 02-03/12/2024.

- **Contributions to National and International Conferences as Co-author**

[C26] F. Crea, C. De Stefano, **A. Irto**, G. Lando, D. Milea, S. Sammartano: Speciation of Lanthanoids(III) in aqueous solution. Sequestration by Reduced Glutathione. *XXIII Congresso Nazionale della Divisione di Chimica Analitica della Società Chimica Italiana,* Presentazione Poster (P77). Isola d'Elba (LI), 16-20/09/2012.

[C27] C. Bretti, R. M. Cigala, C. De Stefano, **A. Irto**, G. Lando: Thermodynamic parameters and binding ability towards Ca^{2+}, Mg^{2+} and Zn^{2+} of some polyelectrolytes. *XXV Congresso Nazionale della Società Chimica Italiana*. Comunicazione Orale (ANA-O71). Arcavacata di Rende (CS), 07-12/09/2014.

[C28] F. Crea, C. De Stefano, C. Foti, **A. Irto**, D. Milea, A. Pettignano, S. Sammartano: Modelling the dependence on medium and ionic strength of molybdate acid base properties, and its interactions with phytate. *XXVII International Symposium on Metal Complexes - ISMEC 2016*. Comunicazione Orale. Barcellona (Spagna), 07-10/06/2016.

[C29] C. Bretti, R. M. Cigala, G. Gattuso, **A. Irto**, G. Lando, N. Manganaro, S. Sammartano: Acid base properties of water soluble oxacalix[4]arenes and thermodynamics of omocharged interaction with Paraquat dication. *XXVI Congresso Nazionale della Divisione di Chimica Analitica della Società Chimica Italiana*. Presentazione Poster (P91). Giardini Naxos (ME), 18-22/09/2016.

[C30] C. Bretti, R. M. Cigala, F. Crea, C. De Stefano, G. Gattuso, **A. Irto**, G. Lando, D. Milea, S. Sammartano. Acid-Base and Chelating Properties of Gantrez Copolymers. *XXVI Congresso Nazionale della Società Chimica Italiana 2017*. Comunicazione Orale (ANA-OR16). Paestum (SA), 10-14/09/2017.

[C31] C. Bretti, P. Cardiano, R. M. Cigala, C. De Stefano, **A. Irto**, G. Lando, S. Sammartano: Exploring various ligand classes for the efficient sequestration of stannous cations in the environment. *XXVII Congresso della Divisione di Chimica Analitica della Società Chimica Italiana*. Comunicazione Orale (O3-EQ). Bologna (BO), 16-20/09/2018.

[C32] R. M. Cigala, F. Crea, C. De Stefano, **A. Irto**, S. Sammartano: Proprietà acido-base e reattività dei polialcol. *Congresso Congiunto delle Sezioni Sicilia e Calabria della Società Chimica Italiana 2019.* Presentazione Poster (P12). Palermo (PA), 01-02/03/2019.

[C33] R. M. Cigala, F. Crea, C. De Stefano, **A. Irto**, S. Sammartano, Speciation studies of Fe^{3+} in fairly concentrated solutions and enhancement of hydrolysis through the formation of mixed hetero-metal species: Fe^{3+}/Al^{3+}. *International Symposium on Metal Complexes 2019 (ISMEC 2019)*. Presentazione Poster (P5). Debrecen (Ungheria), 11-14/06/2019.

[C34] R. M. Cigala, C. Bretti, F. Crea, **A. Irto**, G. Lando, D. Milea, C. De Stefano, S. Sammartano, Natural and synthetic polymers: characterization of acid-base behaviour and binding properties. *XXVIII Congresso della Divisione di Chimica Analitica della Società Chimica Italiana*. Comunicazione Orale (O2 SES2). Bari (BA), 22-26/09/2019.

[C35] G. Lando, O. Gómez-Laserna, A. Toscano Raffa, I. Costantini, F. Crea, **A. Irto**, A. Cuesta, I. Martinez-Arkarazo, M. Venuti, L. Campagna, P. Cardiano, Archaeometric study of Roman mosaic tesserae from the archaeological area of Villa San Pancrazio (Taormina, Italy): EDXRF and Raman spectroscopy analyses for dating and manufacturing assessment. *XXVIII Congresso della Divisione di Chimica Analitica della Società Chimica Italiana*. Presentazione Poster (P108). Bari (BA), 22-26/09/2019.

[C36] A. Gigliuto, R. M. Cigala, F. Crea, **A. Irto**, D. Milea, S. Sammartano, Investigation on the thermodynamic properties of two antibacterial drugs in aqueous solution. *XXVIII Congresso della Divisione di Chimica Analitica della Società Chimica Italiana*. Presentazione Poster (P126). Bari (BA), 22-26/09/2019.

[C37] P. Cardiano, **A. Irto**, K. Chand, R. M. Cigala, F. Crea, C. De Stefano, G. Gattuso, S. Sammartano, M. A. Santos, Binding and sequestering ability of two 3-hydroxy-4-pyridinones towards metal cations of biological and environmental interest. 20th *European Meeting on Environmental Chemistry*. Presentazione Poster (5P56). Lodz (Polonia), 02-05/12/2019.

[C38] P. Cardiano, R. M. Cigala, F. Crea, C. De Stefano, **A. Irto**, D. Milea, S. Sammartano, Nature as Resource. Characterization of natural and synthetic polymers: acid-base properties and sequestering ability towards bivalent metal cations. *20th European Meeting on Environmental Chemistry*. Presentazione Poster (5P57). Lodz (Polonia), 02-05/12/2019.

[C39] O. Gómez-Laserna, G. Lando, P. Irizar, **A. Irto**, C. Bretti, I. Martinez-Arkarazo, L. Campagna, P. Cardiano, THE ROMAN MOSAIC TESSERAE FROM VILLA SAN PANCRAZIO (TAORMINA, ITALY): EDXRF AND RAMAN SPECTROSCOPY ANALYSES FOR MANUFACTURING ASSESSMENT, *14th International GeoRaman conference*. Comunicazione per GeoRaman 2020. Bilbao (Spagna), 02-05/11/2020.

[C40] R. M. Cigala, F. Crea, C. De Stefano, A. Gigliuto, **A. Irto**, Speciation studies of antibacterial drugs. *DOCTOCHEM, third edition*. Comunicazione Orale (L16). Microsoft Teams, 19-20/11/2020.

[C41] A. Gigliuto, C. Bretti, P. Cardiano, R. M. Cigala, F. Crea, C. De Stefano, **A. Irto**, G. Lando, D. Milea, Studi termodinamici in soluzione acquosa di due importanti farmaci antibatterici. *Workshop della Sezione Sicilia della Società Chimica Italiana 2020*. Comunicazione Orale (OC8). Microsoft Teams, 03/12/2020.

[C42] A. Gigliuto, C. Alessandrello, P. Cardiano, R. M. Cigala, **A. Irto**, C. De Stefano, F. Crea, Study of the formation of complexes between dopamine and different cations of biological and environmental interest in NaCl aqueous solution at different ionic strengths and temperatures, *International Symposium on Metal Complexes 2021 (ISMEC 2021)*. Presentazione Poster (P25). Microsoft Teams, 16-18/06/2021.

[C43] **A. Irto**, G. Micalizzi, C. Bretti, M. Morganti, M. Venuti, L. Campagna, C. De Stefano, L. Mondello, P. Cardiano, Analysis on organic residues from Hellenistic and Roman pottery in ancient Taormina: the contexts from the domus in Villa San Pancrazio, *XXVII Congresso Nazionale della Società Chimica Italiana*, Presentazione Poster (ANAPO062). Piattaforma Ibrida.io, 14-23/09/2021.

[C44] R. M. Cigala, F. Crea, C. De Stefano, A. Gigliuto, **A. Irto**, Speciation studies of biological molecules with metals, *DOCTOCHEM, fourth edition*. Comunicazione Orale (L3). Messina, 25-26/11/2021.

[C45] P. Irizar, A. Pintor-Rial, **A. Irto**, M.A Olazabal, I. Martinez-Arkarazo, P. Cardiano, O. Gómez-Laserna, BPA-free Epoxy–Silica Hybrid Materials of Natural Origin for Stone Conservation: Inhibition Potential Against Biocolonization, *21st European Meeting on Environmental Chemistry (EMEC21)*. Presentazione Poster. Novi Sad (Serbia), 30/11-03/12/2021.

[C46] V. Chiaia, G. Micalizzi, D. Donnarumma, **A. Irto**, C. Bretti, P. Cardiano, C. De Stefano, P. Q. Tranchida, L. Mondello, Gas and liquid chromatography approaches coupled to mass spectrometry for the evaluation of thermal-oxidation lipid products in ageing studies, *INTERNATIONAL CONGRESS CHEMISTRY FOR CULTURAL HERITAGE*, 6th ChemCH Congress. Presentazione poster. Ravenna (Italia), 04-08/07/2022.

[C47] V. Chiaia, G. Micalizzi, D. Donnarumma, **A. Irto**, C. Bretti, P. Cardiano, P. Q. Tranchida, L. Mondello, CHARACTERIZATION OF IN-LAB AGED LIPIDS BY USING GAS AND LIQUID CHROMATOGRAPHY APPROACHES COUPLED TO MASS SPECTROMETRY, *XXIX Congresso della Divisione di Chimica Analitica della Società Chimica Italiana*. Comunicazione Orale (AMB-OR09). Milazzo (ME), 11-15/09/2022.

[C48] R. M. Cigala, C. De Stefano, **A. Irto**, P. Lanzafame, G. Papanikolaou, F. Crea, RESIDUES OF THE HERBICIDE: AMINOMETHYLPHOSPHONIC ACID METABOLITE OF THE GLYPHOSATE, *XXIX Congresso della Divisione di Chimica Analitica della Società Chimica Italiana*. Presentazione Poster (EQ-PO04). Milazzo, 11-15/09/2022.

[C49] V. Chiaia, G. Micalizzi, D. Donnarumma, **A. Irto**, C. Bretti, P. Cardiano, L. Mondello, GC And HPLC Separation Techniques for the Elucidation of Aged Lipid Compounds in Archaeological Context, *Incontri di Scienza delle Separazioni*. Presentazione Poster (Poster 3), Firenze, 17-18/11/2022.

[C50] D. Crisafulli, F. Mancuso, M. Milone, **A. Irto**, R. M. Cigala, G. Lando, I. Pisagatti, A. Notti, G. Gattuso, ONE OXACALIX[4]ARENE, SEVEN PROTONATED SPECIES: A MACROCYCLIC RECEPTOR FOR PARAQUAT. *DOCTOCHEM, 5th edition*. Comunicazione Orale. Messina, 29-30/11/2022.

[C51] V. Chiaia, G. Micalizzi, D. Donnarumma, **A. Irto**, C. Bretti, P. Cardiano, L. Mondello, USING GC-MS AND HPLC-MS APPROACHES TO EVALUATE LIPIDS IN ARCHAEOLOGICAL CONTEXT, *DOCTOCHEM, 5th edition*. Comunicazione Orale . Messina, 29-30/11/2022.

[C52] D. Crisafulli, F. Mancuso, M. Milone, **A. Irto**, R. M. Cigala, G. Lando, I. Pisagatti, A. Notti, G. Gattuso, Tetraamino-dihydroxy-tetraoxacalix[4]arene as a versatile paraquat receptor. *CONVEGNO CONGIUNTO SEZIONI CALABRIA E SICILIA DELLA SOCIETÀ CHIMICA ITALIANA (SCICaSi) 2022*. Comunicazione Orale (O10). Reggio Calabria, 01-02/12/2022.

[C53] S. G. M. Raccuia, **A. Irto**, C. Bretti, D. Milea, G. Lando, P. Cardiano, Preparazione di nuovi materiali adsorbenti per la sequestrazione di Cd(II) a partire da scarti di lavorazione del bergamotto. *CONVEGNO CONGIUNTO SEZIONI CALABRIA E SICILIA DELLA SOCIETÀ CHIMICA ITALIANA (SCICaSi) 2022*. Comunicazione Orale (O21). Reggio Calabria, 01-02/12/2022.

[C54] C. Bretti, P. Cardiano, R. M. Cigala, **A. Irto**, F. Crea, C. De Stefano, Complexation of environmentally and biologically relevant metals with 3- hydroxy-1,2-dimethyl-4(1H)-pyridone (Deferiprone), *International Symposium on Metal Complexes 2023 (ISMEC 2023)*. Presentazione Poster (P9). Urbino, 11-14/06/223.

[C55] F. Mancuso, D. Crisafulli, M. Milone, **A. Irto**, R. M. Cigala, G. Lando, I. Pisagatti, A. Notti, G. Gattuso, TETRAMMINO-DIIDROSSI-TETRAOSSACALIX[4]ARENI: NUOVI RECETTORI PER IL PARAQUAT DICLORURO, *XIX Convegno Nazionale sulle Reazioni Pericicliche e Sintesi di Etero e Carbocicli* (CIRP), Comunicazione Orale (OC-08, **coautore**). Reggio Calabria, 29-30/06/2023.

[C56] V. Chiaia, G. Micalizzi, D. Donnarumma, **A. Irto**, C. Bretti, P. Cardiano, L. Mondello, THERMAL DEGRADATION CHEMISTRY OF LIPIDS: AN AGEING STUDY ON EVOO SAMPLES BY MEANS OF GAS AND LIQUID CHROMATOGRAPHY-MASS SPECTROMETRY TECHNIQUES, *XXX Congresso della Divisione di Chimica Analitica della Società Chimica Italiana*. Comunicazione Orale (O18-ABC). Vasto (CH), 17-21/09/2023.

[C57] C. Bretti, P. Cardiano, R. M. Cigala, F. Crea, **A. Irto**, G. Lando, D. Milea, C. De Stefano, MEDIUM AND IONIC STRENGTH DEPENDENCE OF FORMATION CONSTANTS. THE "PURE WATER" MODEL, *XXX Congresso della Divisione di Chimica Analitica della Società Chimica Italiana*. Comunicazione Orale (O10-Eq). Vasto (CH), 17-21/09/2023.

[C58] C. Alessandrello, R. M. Cigala, **A. Irto**, C. De Stefano, G. Zaffino, E. Lopis, F. Crea, LEACHATE FROM LANDFILL OF MUNICIPAL SOLID WASTE: CHARACTERIZATION AND DETERMINATION OF THERMODYNAMIC PROPERTIES, *XXX Congresso della Divisione di Chimica Analitica della Società Chimica Italiana*. Presentazione Poster (ABC-P2). Vasto (CH), 17-21/09/2023.

[C59] S. G. M. Raccuia, **A. Irto**, G. Lando, A. Pettignano, P. Cardiano, C. De Stefano, Bergamot pomace adsorbent material for the removal of heavy metal ions from aqueous solutions, *XXX Congresso della Divisione di Chimica Analitica della Società Chimica Italiana*. Presentazione Poster (ABC-P15). Vasto (CH), 17-21/09/2023.

[C60] R. M. Cigala, **A. Irto**, C. Bretti, D. Milea, C. De Stefano, F. Crea, EQUILIBRIUM STUDIES ON A PESTICIDE METABOLITE, THE AMPA, AND ON THE DIMETHYLTIN(IV) CATION IN MULTICOMPONENT SYSTEMS, *XXX Congresso della Divisione di Chimica Analitica della Società Chimica Italiana*. Presentazione Poster (Eq-P3). Vasto (CH), 17-21/09/2023.

[C61] V. Chiaia, G. Micalizzi, D. Donnarumma, G. Lando, **A. Irto**, C. Bretti, P. Cardiano, L. Mondello, In-lab Ageing Studies on Extra-Virgin Olive Oil and Characterization of the Main Degradation Products by means of Gas and Liquid Chromatography Approaches, *DOCTOCHEM, 6th edition*. Comunicazione Orale. Messina, 29-30/11/2023.

[C62] C. Alessandrello, R. M. Cigala, **A. Irto**, C. De Stefano, G. Zaffino, E. Lopis, F. Crea, Leachate from landfill of municipal solid waste: characterization and determination of thermodynamic properties, *DOCTOCHEM, 6th edition*. Comunicazione Orale. Messina, 29-30/11/2023.

[C63] S. G. M. Raccuia, **A. Irto**, G. Lando, G. De Luca, D. Lascari, N. Muratore, A. Pettignano, P. Cardiano, C. De Stefano, Valorisation of waste biomasses for circular economy: a case study on various pomaces as sorbents for metal cations removal and source of added value compounds, *DOCTOCHEM, 6th edition*. Comunicazione Orale. Messina, 29-30/11/2023.

[C64] C. Alessandrello, **A. Irto**, R. M. Cigala, C. De Stefano, F. Crea, Thermodynamic study of binary and ternary interactions of adrenaline in presence of Cu^{2+} and Gantrez® AN169, *Congresso Congiunto delle Sezioni Sicilia e Calabria della Società Chimica Italiana (SCISiCa) 2023*. Presentazione Poster (PC05). Palermo, 11-12/12/2023.

[C65] S. G. M. Raccuia, **A. Irto**, G. Lando, G. De Luca, S. Cataldo, N. Muratore, A. Pettignano, P. Cardiano, C. De Stefano, Valorisation of waste biomasses for circular economy: a case study on various pomaces as sorbents for metal cations removal and source of added value compounds, *Congresso Congiunto delle Sezioni Sicilia e Calabria della Società Chimica Italiana (SCISiCa) 2023*. Presentazione Poster (PC31). Palermo, 11-12/12/2023.

[C66] S. G. M. Raccuia, **A. Irto**, G. Lando, D. Lascari, N. Muratore, A. Pettignano, P. Cardiano, C. De Stefano. Adsorption of rare-earth metals on multifunctional materials from various pomaces, *4th European NECTAR Conference and Final Action Meeting*. Presentazione Poster (P37). Milazzo, 25-26/02/2024.

[C67] E. Zanda, **A. Irto**, C. Bretti, P. Cardiano, C. De Stefano, G. De Luca, D. Milea, M. Formica, S. G. M. Raccuia, G. Lando, Green synthesis of biomass-derived Carbon Quantum Dots for metal ion sensing: optimization, characterization, and binding affinity studies, *International Symposium on Thermodynamics of Metal Complexes (ISMEC) 2024*, Comunicazione Orale, Nizza (Francia), 10-13/06/2024.

[C68] S. G. M. Raccuia, **A. Irto**, D. Lascari, N. Muratore, A. Pettignano, E. Zanda, C. Granata, D. Milea, C. Bretti, P. Cardiano, C. De Stefano, G. Lando, Valorisation of waste biomasses for the recovery of Critical Raw Materials, *International Symposium on Thermodynamics of Metal Complexes (ISMEC) 2024*, Presentazione Poster, Nizza (Francia), 10-13/06/2024.

[C69] C. Bretti, D. Milea, G. Lando, P. Cardiano, F. Crea, G. Gattuso, R. M. Cigala, **A. Irto**, C. De Stefano, Thermodynamic Insights into Trans-Aconitate Interactions with different cations of biological and environmental importance, *XXVIII Congresso Nazionale della Società Chimica Italiana*, Comunicazione Orale (ANA-OR-065), Milano, 26-30/08/2024.

[C70] S. G. M. Raccuia, **A. Irto**, D. Lascari, N. Muratore, A. Pettignano, E. Zanda, C. Granata, C. Bretti, P. Cardiano, C. De Stefano, G. Lando, Adsorption isotherms and kinetics of rare earth metals on multifunctional materials from various waste pomaces, *XXVIII Congresso Nazionale della Società Chimica Italiana*, Presentazione Poster (ANA-PO-041), Milano, 26-30/08/2024.

[C71] E. Zanda, **A. Irto**, C. Bretti, P. Cardiano, C. De Stefano, G. De Luca, D. Milea, M. Formica, S. G. M. Raccuia, G. Lando, A chemometric approach for the optimization of the synthesis of biomass-based Carbon Quantum Dots, *XXVIII Congresso Nazionale della Società Chimica Italiana*, Comunicazione Orale (ANA-PO-052), Milano, 26-30/08/2024.

[C72] P. Cardiano, **A. Irto**, S. G. M. Raccuia, E. Zanda, C. Bretti, M. Formica, E. Macedi, M. Sanadar, M. Tolazzi, A. Melchior, C. De Stefano, G. Lando, Characterization of bergamot, grape and olive pomaces using different analytical techniques, *XXVIII Congresso Nazionale della Società Chimica Italiana*, Comunicazione Orale (ANA-PO-138), Milano, 26-30/08/2024.

[C73] G. Micalizzi, V. Chiaia, D. Donnarumma, **A. Irto**, C. Bretti, M. Venuti, G. Lando, P. Cardiano, L. Mondello, An ageing study on EVOO by GC and HPLC techniques coupled to mass spectrometry for discriminating olive oil lipid substances in archaeological artifacts. *28th International Symposium on Separation Sciences ISSS2024*, Comunicazione Orale (OL-5), Messina, 23-25/09/2024.

[C74] E. Zanda, **A. Irto**, C. Bretti, P. Cardiano, C. De Stefano, G. De Luca, D. Milea, M. Formica, S. G. M. Raccuia, G. Lando. Optimization and characterization of biomass Carbon Quantum Dots for metal ion sensing, *1st LUCES TRAINING SCHOOL: How to develop a sensor? Academic approaches vs. Industrial interests*, Comunicazione Orale (C7), Kaiserslautern (Germania), 18-20/09/2024.

[C75] E. Zanda, **A. Irto**, C. Bretti, P. Cardiano, C. De Stefano, G. De Luca, D. Milea, E. Macedi, M. Formica, S. G. M. Raccuia, G. Lando, Enhancing the photoluminescence of citrus-derived Carbon Quantum Dots through Experimental Design, *Congresso Congiunto delle Sezioni Sicilia e Calabria 2024 della Società Chimica Italiana (SciSiCa)*, Flash Communication (FC11), Messina, 02-03/12/2024.

[C76] C. Bretti, P. Cardiano, R. M. Cigala, **A. Irto**, F. Crea, G. Lando, D. Milea, C. De Stefano, A literature survey of La^{3+} hydrolysis in aqueous solution, *Congresso Congiunto delle Sezioni Sicilia e Calabria 2024 della Società Chimica Italiana (SciSiCa)*, Presentazione Poster (PO9), Messina, 02-03/12/2024.

[C77] S. G. M. Raccuia, **A. Irto**, D. Lascari, N. Muratore, A. Pettignano, E. Zanda, C. Granata, D. Milea, C. Bretti, P. Cardiano, C. De Stefano, G. Lando, Recovery of Critical Raw Materials: a comparison between various waste biomasses, *Congresso Congiunto delle Sezioni Sicilia e Calabria 2024 della Società Chimica Italiana (SciSiCa)*, Presentazione Poster (PO46), Messina, 02-03/12/2024.

[C78] E. Zanda, **A. Irto**, S. G. M. Raccuia, D. Lascari, C. Bretti, I. Ielo, G. De Luca, M. Formica, E. Macedi, G. Paladini, F. Caridi, V. Venuti, N. Muratore, A. Pettignano, P. Cardiano, C. De Stefano, G. Lando, Exploitation of citrus industrial by-products: from biosorption to sensing of metal ions, *19th International Conference on Chemistry and the Environment, Environmental Chemistry for Sustainability*, Comunicazione orale, Belgrado (Serbia), 8-12/06/2025.

[C79] C. Bretti, **A. Irto**, C. De Stefano, S. Gama, G. Lando, D. Milea, Modelling the solubility and the acid-base properties of 3,4- pyridinedicarboxylic in aqueous media and binding ability towards some metal cations, *International Symposium on Metal Complexes (ISMEC) 2025,* Presentazione Poster (P-32), Granada (Spagna), 09-12/06/2025.

[C80] S. G. M. Raccuia, V. Vallès, O. Crespo, O. Gibert, C. Granata, **A. Irto**, P. Cardiano, D. Lascari, A. Pettignano, C. De Stefano, J. L. Cortina, G. Lando, From waste to resource: exploring rare earth adsorption on bergamot pomace, *XXXI Congresso della Divisione di Chimica Analitica della Società Chimica Italiana*, Comunicazione orale (O-ABC-21), Pisa, 07-11/09/2025.

[C81] S. G. M. Raccuia, V. Vallès, O. Crespo, O. Gibert, C. Granata, **A. Irto**, P. Cardiano, C. De Stefano, J.L. Cortina, G. Lando, The Sustainable Route: From Citrus Waste to Rare-Earth Recovery, *7th Doctochem,* Comunicazione orale (OC-16), Messina, 13-14/11/2025.

[C82] S. G. M.Raccuia, D. Lascari, C. Granata, **A. Irto**, E. Zanda, C. Bretti, E. Macedi, M. Formica, M. Tolazzi, A. Melchior, A. Pettignano, . Muratore, V. Valles, Os. Crespo, O. Gibert, J. L. Cortina, C De Stefano, P. Cardiano, G. Lando, Bergamot Pomace as a Biosorbent for Rare Earths: Outcomes of the Wastezilla Project, *International Symposium on Metal Complexes, ISMEC 2026*, Comunicazione Orale (OC-10), Udine (Italy), 15-18/06/2026.

[C83] **A. Irto**, R. Cappai, A. Amadeo, M- Peana, G. Cassone, C. De Stefano, C. Bretti, Selective binding in a sustainable framework: trans-aconitic acid and divalent metal cations, *International Symposium on Metal Complexes, ISMEC 2026*, Presentazione Poster (P-07), Udine (Italy), 15-18/06/2026.

[C84] S.G.M. Raccuia, V. Vallès , O. Crespo , O. Gibert, C. Granata , A. Irto, P. Cardiano, D. Lascari , A. Pettignano , C. De Stefano , J.L. Cortina, G. Lando, Waste-derived biosorbents for REEcovery from aqueous systems, *XXII Congresso Nazionale delle Divisione di Chimica dell'Ambiente e dei Beni Culturali della Società Chimica Italiana*, Comunicazione orale (26070), Palermo (Italy), 16-19/06/2026.

[C85] C. Bretti, **A. Irto**, R. Cappai, G. Lando, C. De Stefano, D. Milea, Investigating GLDA and MGDA Interactions with Environmentally Significant Cations, *XXXII Congresso Nazionale della Divisione di Chimica Analitica della Società Chimica Italiana,* Comunicazione Orale (O-ABC-10), Venezia, 6-10/09/2026.

[C86] R.M. Cigala, I. Ielo, F. P. Lamonica, P. Lanzafame, G. Papanikolaou, G. Zaffino, **A. Irto**, C. De Stefano, G. De Luca, F. Crea, Nanostructured Silver-Silicate Composites for Effective Phytohormone Contaminant Remediation *XXXII Congresso Nazionale della Divisione di Chimica Analitica della Società Chimica Italiana,* Presentazione Poster (P-ABC-08), Venezia, 6-10/09/2026.

[C87] A, Irto (1), F. Crea, S. Giacobbe, C. De Stefano, V. Nava, G. Di Bella, G. Vaccari, C. Bretti, R.M. Cigala, Trace Metal Speciation and Environmental Behaviour in Coastal Lagoon Sediments: A Case Study from Faro Lake (Mediterranean Sea), *XXXII Congresso Nazionale della Divisione di Chimica Analitica della Società Chimica Italiana,* Presentazione Poster (P-ABC-10), Venezia, 6-10/09/2026.