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CIQUP Day 2026

University of Porto Campus at Vairão | 23 July 2026


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INSTRUMENTAÇÃO ANALÍTICA E CIENTÍFICA, S.A.


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Grupo I.L.C.


Qlabo
Quality Driven

Dear CIQUP members,

We warmly welcome all participants and wish everyone an engaging and fruitful CIQUP Day.

The morning session, together with the lunch break, will be dedicated to a meeting bringing together CIQUP members, students, and invited guests to foster the exchange and promotion of R&D activities, as well as to showcase some of the new equipment recently acquired by CIQUP through the PRR.

In the afternoon, the CIQUP Scientific Plenary Meeting will take place.

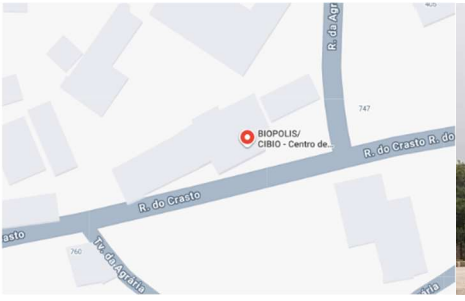
https://ciqup.fc.up.pt/news/entry/ciqup-day-2026

Location

The event will take place at the BIOPOLIS facilities, Quinta do Castro, on the University of Porto Campus at Vairão (Vila do Conde).

Address: R. do Crasto 765, 4485-684 Vairão

GPS: Latitude: 41.332649 | Longitude: - 8.668862



Free Shuttle from Metro Station Mindelo to CIBIO and vice-versa:

Mindelo -> Vairão
Schedule: 09h00 & 13h45

Vairão -> Mindelo
Schedule: 12h30 & 17h05

Program

09:00 – 09:30	**Reception**
09:30 – 09:45	**Opening Session**
09:45 – 10:30	**Round Table** Moderator: Alexandra Gaspar António Fernando Silva · Luís Belchior Santos Carla Morais Carlos Melo Pereira Eduardo Marques
10:30 – 11:15	**Coffee-break & Posters**
11:20 – 12:35	**Oral Presentations**

Speaker	Title	Chair
Cidália André	Pre-service teacher education: The use of a STEM approach in high school chemistry lab classes	Ana Ferreira
Alexandre Alves	A new High-Resolution Gravimetric-Calorimetric System for Gas Sorption	José Carlos Costa
Rita M. F. Cardoso	Waste-Derived Nanocatalysts for Catalytic Ozonation of Textile Dyes	Alexandra Gaspar
Angela do Ó	RNA-Riboswitch Binders for Innovative Antibacterial Discovery	Alexandra Gaspar
Bruno Pinheiro	Study on the volatility and solubility of Halogenated Anisoles	Carlos Lima
Bárbara Jayet Ribeiro	Molecularly Imprinted Nanogel-Based Electrochemical Sensor for Diclofenac Detection in Water.	Isabel Oliveira
Elsa C. Loureiro	Multistimuli-responsive amino acid-based surfactant vesicles as versatile and biocompatible nanocarriers for gene delivery	Isabel Oliveira

12:35 – 12:50	**Closing Remarks** Luís Belchior Santos
12:45 – 14:30	**Posters & Lunch**

14:45 – 17:00	**CIQUP scientific council meeting**

Oral Presentation Abstract

Pre-Service Teacher Education: The Use of STEM Approach Into High School Chemistry Lab Classes

C. André,[1] C. Morais,[1] G. Girotto Júnior[2]

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[2] Instituto de Química, Universidade Estadual de Campinas, R. Josué de Castro, s/n, Cidade Universitária, Campinas–SP, 13083-970, Brasil
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This study is part of an ongoing doctoral research project in science education and focuses on pre-service chemistry teachers' conceptualization of STEM (science, technology, engineering and mathematics) education and their self-efficacy beliefs. Specifically, it examines how these dimensions evolve throughout a targeted training program designed to support the integration of STEM approach into high school chemistry laboratory classes.

A mostly qualitative case study methodology was adopted, involving, until now, a non-probabilistic convenience sample of 15 pre-service chemistry teachers enrolled in a master's degree in physics and chemistry education. The intervention combined theoretical and practical components and was structured in three main phases. First, participants engaged in theoretical training addressing key principles of STEM education. Second, they were introduced to electronic prototyping using Arduino, aiming to develop basic competencies in educational technology and foster connections between chemistry and engineering practices. Finally, participants were involved in two STEM-oriented chemistry laboratory activities aligned with the Portuguese high school curriculum (10th and 11th grades), integrating chemical concepts with technological and problem-solving elements. The first lab activity involved assembling and operating a low-cost colorimeter to measure the concentration of aqueous copper sulfate solutions. The second explored real-time data collection in a closed system that simulated ocean acidification. Both lab activities included pre- and post-laboratory guided reflection opportunities with the goal of engaging future teachers in the process of contextualization of activities, focus on real problem solving and STEM integration.

Data was collected through multiple sources, including questionnaires, guided reflective writings, and interviews, allowing an in-depth analysis of changes in participants' conceptual understanding of STEM education and self-efficacy. Although the study is not yet complete, some very preliminary results suggest a shift in future teachers' conceptualization of STEM education toward a more integrated perspective, along with a greater awareness that their own competence in designing and implementing STEM-based laboratory activities is still developing. When concluded, it is expected that this study may contribute to understanding how structured training experiences can support pre-service teachers in adopting STEM approach in high school chemistry education.

Acknowledgments: This work was supported by national funds through FCT – Fundação para a Ciência e a Tecnologia and co-funded by the European Union through ESF – European Social Fund, under the PhD research grant reference 2024.03426.BD and DOI identifier https://doi.org/10.54499/2024.03426.BD (Co-author C.A.). This work was supported by national funds through FCT – Fundação para a Ciência e a Tecnologia, under the projects UID/00081/2025, UID/PRR/00081/2025 and UID/PRR2/00081/2025 of the Research Center in Chemistry at the University of Porto (CIQUP), and LA/P/0056/2020 of the Institute of Molecular Sciences (IMS). This work was supported by University of Campinas (UNICAMP), and São Paulo State Research Support Foundation (FAPESP – Process 2023/04544-7).

Oral Presentation Abstract

A New High-Resolution Gravimetric-Calorimetric System for Gas Sorption

Alexandre C. P. M. Alves, José C. S. Costa, Luís M. N. B. F. Santos

CIQUP, Institute of Molecular Sciences (IMS), DQB, Faculty of Science,
University of Porto, Portugal
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The study of gas sorption under controlled conditions has gained significant attention in recent years. Porous materials such as activated carbons, metal–organic frameworks (MOFs), and zeolitic imidazolate frameworks (ZIFs) are widely used for CO_2 adsorption and desorption due to their high adsorption capacities.[1] These studies require highly sensitive systems with precise control of temperature and pressure, as well as accurate signal detection. In this work, a combined gravimetric and calorimetric system (SorptionCAL) will be described, enabling the simultaneous measurement of CO_2 adsorption/desorption using a high precision microbalance (CI) coupled with a Calvet microcalorimeter (MS80).

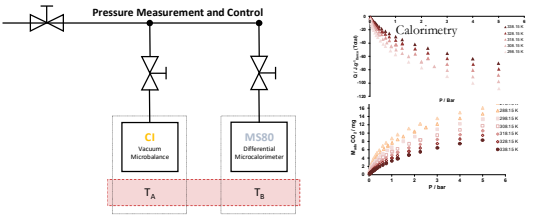

Figure 1. Schematic representation of the SorptionCAL system and experimental results for CO_2 adsorption on activated carbon at different temperatures.

This presentation focuses on the description of the experimental apparatus and the results obtained for CO_2 adsorption on activated carbon and ZIF-8. The calorimetric setup operates over a wide temperature range, from ambient temperature up to 200 °C, while the microbalance operates between 0 and 100 °C. Both systems can be used from high vacuum up to pressures of 5 bar with a heat flow, mass, temperature, and pressure resolutions of 0.1 μW, 1 μg, 10 mK, and 1 mbar. The SorptionCAL system allows both simultaneous and independent measurements at low pressures with high resolution and, by combining the results, derive the enthalpic and entropic contributions of adsorption or absorption processes.

Acknowledgments: This work was supported by (FCT) (funded by national funds through the FCT/MCTES (PIDDAC)) to CIQUP, Faculty of Science, University of Porto (Project UIDB/00081/2020: DOI 10.54499/UIDP/00081/2020), IMS-Institute of Molecular Sciences (LA/P/0056/2020)) A.C.P.M.A. also thanks the FCT and the European Social Fund (ESF) for the award of a Ph.D. Research Grant (ref. 2022.11108.BD).

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Oral Presentation Abstract

Waste-Derived Nanocatalysts for Catalytic Ozonation of Textile Dyes

Rita M. F. Cardoso,[1] Joaquim C.G. Esteves da Silva,[1] Luís Pinto da Silva[1]

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The textile industry plays an important role in economic development, but it is also one of the main sources of water pollution due to its high water consumption and the production of large volumes of effluents containing persistent and toxic dyes, whose high resistance to biodegradation makes them difficult to remove through conventional treatment methods[1]. Improper disposal of these dyes compromises water quality, posing risks to human health and the integrity of ecosystems, which highlights the need for more efficient and economically viable treatment solutions[2]. Advanced oxidation processes (AOPs) are emerging as a competitive technology, with ozonation being one of the most promising approaches for the degradation of organic pollutants. Recently, nanomaterials have demonstrated high potential as nanocatalysts in ozonation, promoting the decomposition of ozone and the formation of highly reactive free radicals, which enhance the degradation and mineralization of pollutants. Furthermore, incorporating organic waste into their synthesis not only adds value to these waste materials but also makes nanomaterials particularly attractive from both an economic and environmental standpoint[3].

To this end, a copper(II)-doped nanocatalyst was synthesized via hydrothermal synthesis, using corn stover and polyethylene glycol as carbon precursors and passivating agents. The objective of this study was to evaluate the application of this nanocatalyst in ozone-based AOPs for the degradation of different textile dyes. The choice of corn stover as a carbon precursor combines the abundance and low cost of this agricultural waste with the development of a more sustainable synthesis process, without compromising catalytic efficiency.

The synthesized nanocatalyst demonstrated high efficiency in ozonation, promoting an enhancement of approximately 200% in the degradation rate constant of textile dyes, allowing complete degradation of the dyes in considerably shorter average times than the conventional process. In the case of methyl orange dye, simple ozonation took 23 minutes (36.8 Wh), while the catalytic route promoted complete degradation of the dye in just 8 minutes (12.8 Wh), corresponding to a reduction of about 65% in energy consumption. This highlights the positive impact of the nanocatalyst on the efficiency and energy sustainability of the treatment.

Acknowledgments: Fundação para a Ciência e Tecnologia (FCT, Portugal) for projects LA/P/0056/2020, UID/00081/2025, and UID/PRR/00081/2025, and 2023.13127.PEX, and the iCHEM4m project (NORTE2030).

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Oral Presentation Abstract

RNA-Riboswitch Binders for Innovative Antibacterial Discovery

Ângela do Ó,[1] Manuela Machado,[2] Eduardo Soares,[2] Jorge Garrido,[1,2] Alexandra Gaspar[1]

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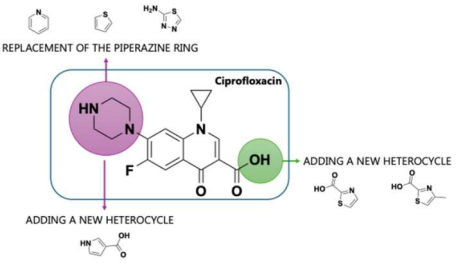
[2] ISEP, Department of Chemical Engineering, Rua Dr António Bernardino de Almeida, 431, 4200-072, Porto

The growing prevalence of antimicrobial resistance (AMR) is jeopardizing the clinical effectiveness of existing antibiotics and creating an urgent need for antibacterial agents with novel mechanisms of action (MoAs).[1,2] A major challenge in antibacterial drug discovery is identifying first-in-class molecules that engage previously underexploited therapeutic targets. This work aims to discover and develop new small molecules that target bacterial non-coding RNA structures, specifically riboswitches, as a potential strategy for innovative antibacterial drug discovery.[3,4]

The fluoroquinolone scaffold, known for its antibacterial properties, was tailored with chemical fragments thought to interact with non-coding RNA to generate potential dual-target antibacterial agents. Sulfur- and nitrogen-containing heterocycles were introduced into the ciprofloxacin scaffold through esterification, amidation, and Suzuki coupling reactions. These synthetic approaches afforded a series of novel ciprofloxacin derivatives.



To date, a subset of the designed compounds has been successfully synthesized. These compounds underwent phenotypic evaluation against Gram-positive and Gram-negative bacteria. Antibacterial activity is being assessed by determining minimum inhibitory concentrations (MICs) and minimum bactericidal concentrations (MBCs).

This study establishes a synthetic platform for developing ciprofloxacin-based derivatives incorporating potential RNA-binding heterocyclic motifs. The preliminary biological evaluation has allowed assessment of antibacterial potential and supports the exploration of riboswitches as novel targets for addressing AMR.

Acknowledgments: This work was FCT-funded under project UIDB/00081/2025 (CIQUP) and LA/P/0056/2020 (IMS), DOI: 10.54499/LA/P/0056/2020.

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Oral Presentation Abstract

Study on the Volatility and Solubility of Halogenated Anisoles

B. D. A. Pinheiro, A. R. R. P. Almeida, C. F. R. A. C. Lima, M. J. S. Monte

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Halogenated anisole derivatives - such as 4-chloro-2-iodoanisole, 2,4-dibromoanisole, and 3,5-dibromoanisole - constitute a significant class of aromatic compounds that serve as key intermediates in diverse organic synthesis applications. These molecules are widely used in the production of biologically active substances, including pharmaceutical agents and agrochemicals[1]. The thermodynamic properties of halogenated anisoles are crucial in determining their environmental distribution, persistence, and bioaccumulation potential. Of particular interest are 2,4-dibromoanisole and 3,5-dibromoanisole, which share structural similarities with known semi-volatile organic pollutants and are therefore considered potential persistent organic pollutants (POPs)[1]. By integrating data on sublimation and solubility, obtained from vapor pressure and aqueous solubility measurements, key environmental mobility parameters such as the Gibbs energy of solvation (hydration) and Henry's law constants can be calculated. In this study, vapor pressures of both condensed phases (crystalline and liquid) of 4-chloro-2- iodoanisole, 2,4-dibromoanisole, and 3,5-dibromoanisole were measured using a static method based on capacitance diaphragm manometers[2] and the Knudsen mass-loss effusion method[3]. From these measurements, standard molar enthalpies, entropies, and Gibbs energies of sublimation and vaporization were derived. The aqueous solubility (Sw) of the three compounds at 298.15 K was determined via the shake-flask method[4], followed by UV-Vis spectrophotometry. Thermal analysis was performed using differential scanning calorimetry (DSC) to determine fusion properties and crystalline heat capacities. Combining all experimental data, the Gibbs energy of solvation and Henry's law constants were calculated, offering valuable insight into the environmental mobility and behavior of these halogenated anisoles in various environmental contexts.

Acknowledgments: Work supported by the Fundacão para a Ciência e Tecnologia (FCT) (funded by national funds - FCT/MCTES (PIDDAC)) to CIQUP, Faculty of Sciences, University of Porto (Project UIDB/00081/2020) and IMS - Institute of Molecular Sciences (LA/P/0056/2020). BDAP thanks FCT for the award of a PhD research grant (UI/BD/152715/2022).

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Oral Presentation Abstract

Molecularly Imprinted Nanogel-Based Electrochemical Sensor for Diclofenac Detection in Water.

Bárbara Ribeiro,[1] Ana T. Silva,[1] Marcus Monteiro,[1] Manuel Azenha,[1] José A. Ribeiro[2]

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Molecularly imprinted polymers (MIPs) are synthetic materials with specific binding sites for the selective recognition of target analytes. Their high selectivity, chemical stability, and scalable, cost-effective production make them attractive alternatives to biological receptors in sensing applications.1 This work aimed to develop molecularly imprinted nanogels (nanoMIPs) for the selective recognition and electrochemical detection of diclofenac, a widely used pharmaceutical frequently detected in aquatic environments. NanoMIPs were synthesized by precipitation polymerization and characterized by dynamic light scattering (DLS) and scanning electron microscopy (SEM) to assess their size and morphology. Finally, affinity studies were performed to evaluate diclofenac recognition by nanoMIPs compared with non-imprinted nanoparticles (NIPs). Precipitation polymerization proved to be a simple and efficient approach, yielding nanoMIPs with promising molecular recognition properties and strong potential for water-quality monitoring.

Acknowledgments: This work was co-funded by the ERDF through the Innovation and Digital Transition Program (COMPETE 2030) under Portugal 2030 and by National Funds through the FCT within the WaveSense project, with reference 17176 (COMPETE2030-FEDER-00865400).

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Oral Presentation Abstract

Multistimuli-Responsive Amino Acid-Based Surfactant Vesicles as Versatile and Biocompatible Nanocarriers for Gene Delivery

E.C. Loureiro,[1] I.S. Oliveira,[1] M.L. do Vale,[2] B. Silva,[3] A.C. Gomes,[3] E.F. Marques[1*]

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Recent advances in non-viral gene therapy have driven the development of colloidal nanocarriers for efficient nucleic acid (NA) delivery. Among these, surfactant-based lipoplexes stand out as versatile and tunable vectors.[1] Amino acid-based surfactants are particularly promising building blocks due to their biocompatibility, biodegradability, and stimuli-responsive behavior[2]. In this work, cationic vesicles (Figure 1) were developed using novel pH- and redox-responsive amino acid-based gemini surfactants, namely the serine/cysteine-derived (12(SerCys)$_2$12 and the cleavable serine-derived gemini surfactant ((12Ser)$_2$EA5, combined with DOPE and cholesterol[3]. The resulting vesicles displayed tunable physicochemical properties, with increasing surfactant concentration leading to higher surface charge and smaller particle size. Their size and charge were further modulated by composition and environmental conditions, including pH, redox environment, and ionic strength. Following extrusion, the vesicles efficiently complex nucleic acids, forming stable and monodisperse lipoplexes. Dynamic light scattering revealed pH- and redox-triggered structural rearrangements under intracellular-mimicking conditions, supporting the potential for stimuli-responsive NA release. Overall, these results highlight amino acid-based surfactant vesicles as versatile and tunable platforms for triggered nucleic acid delivery.

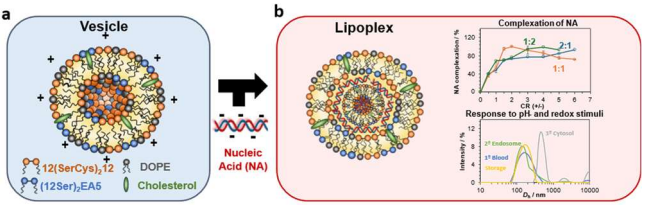

Figure 1. a) Illustrative representation of the cationic surfactant vesicles and b) complexation with NAs and lipoplex response to pH- and redox stimuli.

Acknowledgments: We thank Fundação para a Ciência e Tecnologia, FCT, for financial support through project 2022.05543.PTDC-Smart4Vir, through CIQUP via grants UID/00081/2025, UID/PRR/00081/2025 and UID/PRR2/00081/2025, IMS via grant LA/P/0056/2020 and CBMA via grant UID/BIA/04050/2025.

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List of Scientific Posters

STEM-based laboratory activity in chemistry education: Insights from pre-service teachers
C. Morais, C. André, G. Girotto Júnior

Digital humanities in science communication and digital media projects
A. Ferreira, T. Aguiar, C. Morais, L. Moreira, R. Ribeiro

Alkyl chain effects on morphology and wetting in vacuum-deposited pyridinium-based ionic liquid films
Soraia R. M. R. Silva, João M. S. Pereira, Oleksandr Bondarchuk, Mauro C. C. Ribeiro, Luís M. N. B. F. Santos, and José C. S. Costa

Electrical conductivity of four 1-alkyl-3-methylimidazolium series: evidence of nanostructuring in ionic liquids
Carlos F. P. Miranda, Luís M. N. B. F. Santos

Reactivity patterns in the decomposition of indene adducts of C70 fullerenes via retro Diels-Alder reaction
Carlos S. T. Pinto, Luís M. N. B. F. Santos, Carlos F. R. A. C. Lima

Volatility and solubility properties of the herbicide dichlobenil
Bruno D. A. Pinheiro, Ana R. R. P. Almeida, Manuel J. S. Monte

Atmospheric microplastic aerosols contamination in Porto
C. Diana, L. Yuliya, F. Rui, P. S. Luís, E. S. Joaquim

Sustainable design of fluorescent carbon nanomaterials
C. Inês, P. S. Luís, E. S. Joaquim

Upcycled carbon dots from agricultural waste for enhanced water treatment via catalytic ozonation
C. Rita, E. S. Joaquim, P. S. Luís

Smart topical delivery through an inversely coupled thermogelling hybrid hydrogel
R. L. Machado, E. C. Loureiro, S. G. Silva, I. S. Oliveira, A. C. Gomes, E. F. Marques

Surfactant-assisted exfoliation and dispersion of graphene nanoplatelets aiming at quantum technologies applications
C. D. Pedro, J. M. Pereira, E. C. Loureiro, N. Lekshmi, A. L. Lopes, I. S. Oliveira, J. P. Araújo, E. F. Marques

Linking nanostructure and biological performance in cleavable serine-derived gemini surfactant/monoolein lipoplexes
B. Silva, I. S. Oliveira, S. G. Silva, M. L. do Vale, A. C. Gomes, E. F. Marques

Fluoroquinolone-based RNA riboswitch binders as novel drug discovery platforms against antimicrobial resistance
Ângela do Ó, Manuela Machado, Eduardo Soares, Jorge Garrido, Alexandra Gaspar

Sensor eletroquímico à base de filmes de hidrogel para rastreio de doenças cardiovasculares
Marcus V. Monteiro, Manuel Azenha, Tiago Teixeira, José A. Ribeiro

List of Posters – New Equipment Acquired by CIQUP

Microwave Synthesizer | **CEM DISCOVER 2.0**
Automated microwave synthesizer for rapid and reproducible chemical synthesis with precise temperature and pressure control.

Automated Flash Chromatography System | **Biotage® Selekt**
Automated flash purification platform for fast, scalable chromatographic separations.

Microplate Reader | **BMG LABTECH FLUOstar Omega**
Multimode microplate reader for absorbance, fluorescence, and luminescence measurements in endpoint and kinetic assays.

Triple Quad LC/MS/MS | **PerkinElmer QSight® 220**
LC-MS/MS platform combining high-resolution chromatographic separation with highly selective tandem mass spectrometric detection.

FT-IR Microscope | **BRUKER FT-IR Microscope Lumos II**
Fully automated FT-IR microscope for high-resolution chemical imaging and microspectroscopic analysis.

Electrophoresis System | **WEALTEC BIO-RAD Electrophoresis**
High-resolution biomolecule separation and digital documentation.

Dynamic Light Scattering | **Malvern Zetasizer Advance Ultra**
High-resolution characterization of particle size, size distribution, molecular weight, and zeta potential.

Flash Differential Scanning Calorimetry | **Mettler Toledo Flash DSC 2+**
High-speed differential scanning calorimeter enabling the analysis of rapid thermal transitions and reorganization processes inaccessible by conventional DSC.