



**12th INTERNATIONAL CONFERENCE ON
NEW TRENDS IN CHEMISTRY
10-12 APRIL 2026**

12th ICNTC PROCEEDING BOOK

10-12 APRIL 2026 BARCELONA – SPAIN

**International Conference on New Trends in
Chemistry**



**12th INTERNATIONAL CONFERENCE ON
NEW TRENDS IN CHEMISTRY
10-12 APRIL 2026**

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<http://www.icntcconference.com/>

ICNTC Conference 2026

12th International Conference on New Trends in Chemistry

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Editor:

Prof. Dr. Dolunay ŞAKAR

ICNTC Secretariat

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Conference organised in collaboration with Monre Academy

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Yıldız Technical University – Turkey

Chemistry Department

Conference Chair

Prof. Dr. Yelda Yalçın Gürkan

Tekirdag Namik Kemal University – Turkey

Chemistry Department

Conference Co-Chair

Dear Colleagues,

I am honoured to invite and send you this call for papers on behalf of Conference Organisation Board of “ **12th International Conference on New Trends in Chemistry**”, to be held in Barcelona, Spain on the dates between April 10-12, 2026

Limited number of Papers and Posters with the below mentioned topics will be accepted for our conference:

- Analytical Chemistry
- Bio Chemistry
- Computational Chemistry
- Chemistry Education
- Environmental Chemistry
- Food Chemistry
- Forensic chemistry
- Inorganic Chemistry
- Material Chemistry
- Organic Chemistry
- Physical Chemistry
- Polymer Chemistry and Applications
- Pharmaceutical Chemistry

The selected papers which are presented as oral in the conference will be published in an international peer-reviewed journal which is indexed by SCOPUS as Q4. Each manuscript will have doi Numbers.

We kindly wait for your attendance to our conference to be held on 10-12 April 2026 in Barcelona, SPAIN

All informations are available in conference web site. For more information please do not hesitate to contact us.

info@icntcconference.com

Respectfully Yours,

On Behalf of the Organization Committee of ICNTC Conference

Prof. Dr. Dolunay ŞAKAR

12th ICNTC 2026 | Conference Chair

Yıldız Technical University – Istanbul / Türkiye

Chemistry Department

Prof. Dr. Yelda YALÇIN GÜRKAN

12th ICNTC 2026 | Conference Co-Chair

Tekirdağ Namık Kemal University – Tekirdağ / Türkiye

Chemistry Department

1. CONFERENCE VENUE

2. TEMBO HOTEL BARCELONA

3. 10 APRIL 2026 FRIDAY

4.

5.

Welcome Speech (08:50 - 09:00)
Prof. Dr. Dolunay ŞAKAR, Yıldız Technical University Conference Co Chair

6.

7.

SESSION A (09:00 – 10:40)
SESSION CHAIR: Prof. Dr. Sevil YÜCEL

8.

9. 09:00 – 09:20

10. PAPER TITLE : CARBON DIOXIDE-BASED FUNCTIONAL CYCLIC CARBONATES: AMINO ACID-BASED IRON(III) AND COBALT(III) COMPLEXES CATALYSED COUPLING OF CO₂ AND EPOXIDES

11. AUTHOR(S) : **Adnan S. ABU-SURRAH**, Jumana N. AYYAD

12.

13. 09:20 – 09:40

14. PAPER TITLE : BIOMASS ENERGY PRODUCTION FROM SUNFLOWER PLANT

15. AUTHOR(S) : **Emek MOROYDOR DERUN**, Shalala HABIBZADE, Deniz UYGUNÖZ

16.

17. 09:40 – 10:00

18. PAPER TITLE : SYNTHESIS AND CHARACTERIZATION OF ECO-FRIENDLY EDIBLE FILMS BASED ON PISTACHIO SHELL AND PEANUT OIL

19. AUTHOR(S) : Kerem AKDEMİR, Hilal GÖNÜLTAİ, Burge KÖSE IŞIK, **Nurcan TUĞRUL**

20.

21. 10:00 – 10:20

22. PAPER TITLE : UTILIZATION OF SUGAR BEET PULP AS AN AGRICULTURAL BY-PRODUCT IN VEGAN LEATHER PRODUCTION

23. AUTHOR(S) : Alize MENEKSE, **Burge KÖSE IŞIK**, Nurcan TUGRUL

24.

25. 10:20 – 10:40

26. PAPER TITLE : NATURAL PIGMENTS DOPED POLYMER FILMS SYNTHESIS BY SOLUTION CASTING METHOD AND CHARACTERIZATION

27. AUTHOR(S) : **Deniz UYGUNÖZ**, Ibrahim ŞENGÖR, Emek MOROYDOR DERUN

28.

TEA & COFFEE BREAK 10:40 – 11:00

29.

30.

31.

32.

SESSION B (11:00 – 13:00)

SESSION CHAIR: Prof. Dr. Emek MOROYDOR DERUN

33.

34. 11:00 – 11:20

35. PAPER TITLE : A NEW APPROACH TO THE SYNTHESIS OF A SELENIUM-DOPED BIOACTIVE GLASS

36. SYSTEM: IMPLICATIONS FOR BIOACTIVITY AND DEGRADATION BEHAVIOR

37. AUTHOR(S) : **Sevil YÜCEL**, Yeşim AYIK, Şeref YILDIRIM, Sinem ARSLAN, Doğa Berşan

38. GÜNEŞ, Esra Nur TURAL, Alperen ARICI, Cem ÖZEL, Deniz SAKARYA, Ali Can ÖZARSLAN

39.

40. 11:20 – 11:40

41. PAPER TITLE : SYNERGISTIC THERMAL–UV STRESS ACCELERATES HBCD RELEASE FROM BACK-COATED TEXTILES: VOLATILE AND NANOSCALE PARTICULATE PATHWAYS

42. AUTHOR(S) : **Raed GHANEM**

43.

44.

45. 11:40 – 12:00

46. PAPER TITLE : EFFECTS OF STRONTIUM AND SELENIUM-DOPED BIOACTIVE GLASSES ON SOFT TISSUE APPLICATIONS: AN IN VITRO EVALUATION

47. AUTHOR(S) : **Cem ÖZEL**, Semanur ERCAN, Yeşim AYIK, Şeref YILDIRIM, Sinem ARSLAN, Doğa Berşan

48. GÜNEŞ, Esra Nur TURAL, Deniz SAKARYA, Ali Can ÖZARSLAN, Merve ERGİNER

49. HASKÖYLÜ, Sevil YÜCEL

50.

51. 12:00 – 12:20

52. PAPER TITLE : EFFECT OF TANNIC ACID CONCENTRATION ON MECHANICAL AND STRUCTURAL

53. PROPERTIES OF POLYVINYL ALCOHOL/CHITOSAN/POMEGRANATE PEEL POWDER

54. BASED BIOCOMPOSITE FILMS

55. AUTHOR(S) : Neşe İŞMAN, **Pınar TERZİOĞLU**

56.

57. 12:20 – 12:40

58. PAPER TITLE : THE EFFECTS OF H₂O:TEOS RATIO ON THE COMPOSITION AND MORPHOLOGY OF

59. BIOACTIVE GLASSES SYNTHESIZED BY THE STÖBER METHOD

60. AUTHOR(S) : **Yeşim AYIK**, Doğa Berşan GÜNEŞ, Sinem ARSLAN, Şeref YILDIRIM, Esra Nur TURAL,

61. Alperen ARICI, Cem ÖZEL, Deniz SAKARYA, Ali Can ÖZARSLAN, Sevil YÜCEL

62.

63. 12:40 - 13:00

64. PAPER TITLE : ACTIVATED CARBON FROM GYPSOPHILA ROOTS: A SUSTAINABLE ADSORBENT FOR DYE REMOVAL

65. AUTHOR(S) : Sena Nur **KARABEKİROĞLU**, Meral KOCAOĞLU

66.

67.

68.

69.

LUNCH BREAK 13:00 – 14:00

70.

71.

SESSION C (14:00 – 16:00)

SESSION CHAIR: Prof. Dr. Adnan S. ABU-SURRAH

72.

73.

74. 14:00 – 14:20

75. PAPER TITLE : THE EFFECTS OF HELICHRYSUM ARENARIUM EXTRACT ON
CALCIUM OXALATE CRYSTALLIZATION AS NATURAL INHIBITOR

76. AUTHOR(S) : Sinan ŞİMŞEK, Osman Yahya USOĞLU, **Emel AKYOL**

77.

78. 14:20 – 14:40

79. PAPER TITLE : SYNTHETIC METHODS FOR THE PREPARATION OF CYANO
SUBSTITUTED OXAZOLO[4,5-b]PYRIDINES

80. AUTHOR(S) : **Jurja VUKOVİNSKI**, Marijana Hranjec

81.

82. 14:40 – 15:00

83. PAPER TITLE : RAPID AND HIGH-ACCURACY CARBON DETERMINATION
METHODS FOR SUSTAINABLE CARBON FARMING: IMPLICATIONS
FOR NORTH MACEDONIA'S AGROECOSYSTEMS

84. AUTHOR(S) : **Biljana BALABANOVA**, Verica ILIEVA, Sasa MITREV

85.

86. 15:00 – 15:20

87. PAPER TITLE : SUPRAMOLECULAR INTERACTION OF GABAPENTIN AND
LACTAM WITH CUCURBIT[N]URIL HOST MOLECULES

88. AUTHOR(S) : **Lubna ALRAWASHDEH**, Bayan F. KULAIB, Khaleel I. ASSAF ,
Musa I. EL-BARGHOUTHI,

89. Khaled BODOOR , Osama M. ABUHASAN , Ahmad A. ABDOH

90.

91. 15:20 – 15:40

92. PAPER TITLE : ENZYME-ASSISTED SOXHLET EXTRACTION OF
HELICHRYSUM ARENARIUM AND INVESTIGATION OF THE EFFECT
OF ENZYMES (CELLULASE, PECTINASE, XYLANASE) ON TOTAL
FLAVONOID CONTENT

93. AUTHOR(S) : Sinan ŞİMŞEK, Emel AKYOL, İlknur KUCUK

94.

95. 15:40 – 16:00

96. PAPER TITLE : INVESTIGATION OF TORREFACTION PROCESS CONDITIONS
FOR BIOCHAR PRODUCTION AS AN ALTERNATIVE RENEWABLE
ENERGY SOURCE

97. AUTHOR(S) : Sakine MIZRAK, Merve ŞANALAN, Hediye İrem ÖZGÜNDÜZ

98.

TEA & COFFEE BREAK 16:00 – 16:20

99.

100.

101.

102.

103.

104.

105.

106.

POSTER SESSION A (16:20 – 17:20)

SESSION CHAIRS: Prof. Dr. Sevil YÜCEL, Prof. Dr. Adnan S. ABU-SURRAH, Prof. Dr. Dolunay
ŞAKAR

107.

108.

109. PAPER TITLE : SYNTHESIS AND APPLICATION OF
PENTAAMMINEACETATOCOBALT(III) NITRATE AS A LOW-
TEMPERATURE BLEACHING CATALYST IN DISHWASHING
DETERGENTS

AUTHOR(S) : **Abdullah AVŞAR** , Bilgehan GÜZEL

110. PAPER TITLE : SYNTHESIS, SPECTROSCOPIC CHARACTERIZATION AND TITRATIONS WITH METAL CATIONS OF PYRIDINE HYDRAZONES

111. AUTHOR(S) : **Antonija MAMIĆ**, Marijana HRANJEC

112.

113. PAPER TITLE : SYNTHESIS AND SUBSTITUENT-DEPENDENT TAUTOMERISM OF BENZOTHAZOLYL

114. AZO DYES DERIVED FROM 2-NAPHTHOL

115. AUTHOR(S) : **Anja BEČ**, Robert VIANELLO, Helena CERIĆ, Livio RACANÉ

116.

117. PAPER TITLE : REMOVAL OF ACETAMIPRID FROM WATER BY ADVANCED TREATMENT PROCESSES: EFFICIENCY AND ECOTOXICOLOGICAL ASPECTS

118. AUTHOR(S) : **Bruna BABIĆ VISKOVIĆ**, Danijela AŠPERGER, Anica PAVLINOVIĆ, Davor DOLAR

119.

120. PAPER TITLE : INVESTIGATION OF THE CORRELATION BETWEEN SKIN PERMEATION AND GLOBAL

121. REACTIVITY DESCRIPTORS IN PHENOLIC ANTIOXIDANTS: A COMPARATIVE DFT AND

122. ADMET STUDY

123. AUTHOR(S) : **Beyza KEMANCI**, Şimal KURUMOĞLU, Burak GÜRKAN

124.

125. PAPER TITLE : BRAIN PENETRATION IN CNS AND NON-CNS DRUGS USING MOLECULAR ELECTRONIC

126. PARAMETERS

127. AUTHOR(S) : **Ceren ERGÜL**, Şimal KURUMOĞLU, Yelda Yalçın GÜRKAN

128.

129. PAPER TITLE : REMOVAL OF FLUTAMIDE FROM AQUEOUS SOLUTIONS USING ACTIVATED CARBON DERIVED FROM LAVENDER: AN ADSORPTION STUDY

130. AUTHOR(S) : **Derya ALTINTAŞ**, Esra KULAKSIZ ALAYONT, Ozan YÖRÜK, Yüksel BAYRAK

131.

132. PAPER TITLE : FORENSIC IDENTIFICATION OF PEN INK PIGMENTS USING DUAL-WAVELENGTH

133. RAMAN SPECTROSCOPY COMBINED WITH CHEMOMETRICS

134. AUTHOR(S) : **Dilek SALKIM İŞLEK**, Eda KİRİŞ, Ayşegül Şen YILMAZ, Erdoğan KÖSE

135.

136. PAPER TITLE : SUSTAINABLE HEAVY METAL ION DETECTION OF WASTE-BASED CARBON QUANTUM DOTS

137. AUTHOR(S) : Nour alhuda SALEHA, **Emel AKYOL**

138.

139.

140. PAPER TITLE : PERFORMANCE ASSESSMENT OF FAUJASITE VARIANTS FOR MULTI-METAL ADSORPTION: IMPACT OF MINERAL TYPE AND COMPETITIVE HEAVY METAL INTERACTIONS

141. AUTHOR(S) : **Enas N. MAHMOUD**, Sawsan JAAFREH, Khalil M IBRAHIM, Maram Na'es, Rawan Abu SARHAN

142.

143. PAPER TITLE : MODIFICATION OF BITUMEN BY ADDING REACTIVE TERPOLYMER, POLYOLEFIN ELASTOMER, AND THERMOPLASTIC

144. AUTHOR(S) : **Hediye İrem ÖZGÜNDÜZ**, Burcu Didem ÇORBACIOĞLU, Seyfullah KEYF

145.

146. PAPER TITLE : REMOVAL OF SELECTED POLLUTANTS FROM TEXTILE WASTEWATER USING A HYBRID MBR–NF SYSTEM

147. AUTHOR(S) : **Iva ĆURIĆ**, Anica PAVLINOVIĆ, Davor DOLAR

148.

149. PAPER TITLE : SYNTHESIS OF A NOVEL SYMMETRICAL SILICON PHTHALOCYANINE

150. PHOTSENSITIZERS CONTAINING CARBOXYLIC ACID BASED AXIAL ANCHORING

151. GROUPS

152. AUTHOR(S) : **Gülnur KESER KARAOĞLAN**, Gülşah GÜMRÜKÇÜ KÖSE

153.

154. PAPER TITLE : SYNTHESIS AND CHARACTERIZATION OF A NOVEL SILICON PHTHALOCYANINE

155. CONTAINING CARBOXYLIC ACID GROUPS

156. AUTHOR(S) : **Gülşah GÜMRÜKÇÜ KÖSE**, Gülnur KESER KARAOĞLAN

157.

158. PAPER TITLE :PHOTOINDUCIBLE DECARBOXYLATION IN REACTIONS WITH ALKYNES: REGIOSELECTIVE ADDITION OF ALKYL RADICALS TO THE TRIPLE BOND

159. AUTHOR(S) : **Kinga PIOTROWSKA**, Sebastian BAŚ

160.

161. PAPER TITLE : DOUBLE-SIDED CONTROL OF PRODUCT TYPE PREFERENCE IN THE VISIBLE-LIGHT

162. INITIATED REACTION OF 1,3-DICARBONYL COMPOUNDS WITH ALKENES

163. AUTHOR(S) : **Malgorzata PAŁYGA**, Jan RZEPIELA, Sebastian BAŚ

164.

165.

166. PAPER TITLE : CHEMICAL CHARACTERIZATION OF PM2.5 IN THE URBAN AIR OF TIRANA: SOURCES, CHEMICAL MARKERS AND ATMOSPHERIC SECONDARY PROCESSES

167. AUTHOR(S) : **Megi CAUSHAJ**, Florian MANDIJA, Dhurata PREMTI, Spiro DUSHKU

168.

169. PAPER TITLE : THE INFLUENCE OF THE EXPANSION OF THIOPHENE SUBSTITUENTS ON THE PHYSICOCHEMICAL PROPERTIES AND APPLICATION POSSIBILITIES OF FLUORENE DERIVATIVES

170. AUTHOR(S) : **Pawel KALARUS**, Agata SZLAPA-KULA, Michał FILAPEK, Sławomir KULA

171.

172. PAPER TITLE : ANTIOXIDANT ACTIVITY OF BLACK CABBAGE (*Brassica oleracea* L. var. *sabellica*)

173. FLOWERS

174. AUTHOR(S) : **Yeşim YEŞİLOĞLU**, Bircan ENGİN

175.

176. PAPER TITLE : COMPUTATIONAL TOXICOLOGY of FLUFENAUXIRIM and AMINOCYCLOPYRACHLOR: A DFT REACTIVITY and ECOTOXICITY COMPARISON

177. AUTHOR(S) : Goncagül TUMTUM, Kaan DEMİR, Şimal KURUMOĞLU, **Yelda YALCIN GURKAN**

178.

179. PAPER TITLE : DETERMINATION OF THE CHEMICAL COMPOSITION OF THE ESSENTIAL OIL OF THE

180. RUBIA TINCTORUM PLANT

181. AUTHOR(S) : **Temine SABUDAK**, Bahar EREN, Cansu ÖZÇELİK

182.

183. PAPER TITLE : SYNTHESIS OF N-METHYL-GLUCAMINE VIA REDUCTIVE AMINATION OF GLUCOSE USING CARBON NANOTUBE-SUPPORTED PALLADIUM CATALYST

184. AUTHOR(S) : **Tuğba BAYCAN**, Abdullah AVŞAR, Halil KAVRAMA, Bilgehan GÜZEL

185.

186.

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188.

SOCIAL PROGRAM
HOTEL DEPARTURE 19:45

189.

190.

191.

192.

193. Will be organised as part of conference dinner program

194. Please have your ticket with you

195.

196. Venue : Tablao de Carmen / Poble Espanyol

197. Dress Code Smart Casual

198.

199. Dinner Starting Time : 20:30 / Flamenco Show Starting Time :21:00

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223. 11 APRIL 2026 SATURDAY

224.

225.

SESSION D (08:20 – 11:00)
SESSION CHAIR: Prof. Dr. Emel AKYOL

226.

227. 08:20 – 08:40

228. PAPER TITLE : STABILITY AND ACTIVITY OF BETA-GALACTOSIDASE
IMMOBILIZED ON POLYVINYL ALCOHOL-SODIUM ALGINATE
HYDROGELS

229. AUTHOR(S) : **Doruk AKDOĞAN**, Ayşegül PEKSEL

230.

231. 08:40 – 09:00

232. PAPER TITLE : EFFECT OF HEMP FILLER ON THE MECHANICAL AND
PHYSICAL PROPERTIES OF PLA/PBAT COMPOSITE FILMS

233. AUTHOR(S) : İlknur KÜÇÜK, **Oğuzhan TAVLIBIYIK**

234.

235. 09:00 – 09:20

236. PAPER TITLE : SYNTHESIS, STRUCTURAL CHARACTERIZATION AND
BIOLOGICAL EVALUATION OF AMINO SUBSTITUTED
BENZOXAZOLE DERIVATIVES

237. AUTHOR(S) : **Marina GALIĆ**, Viktorija RAVLIĆ, Leentje PERSONS, Dirk
DAELEMANS, Mihailo BANJANAC, Marijana HRANJEC

238.

239. 09:20 – 09:40

240. PAPER TITLE : DEVELOPMENT OF A DEP-IMPRINTED GQD@PHEMA-PPIM
NANOPARTICLE-BASED SURFACE PLASMON RESONANCE SENSOR
FOR DIETHYL PHTHALATE (DEP) DETECTION

241. AUTHOR(S) : **Monireh BAKHSHPOUR-YUCEL**, Bilgen OSMAN, Cevher
Gündoğdu HIZLİATEŞ, Elif TÜMAY ÖZER

242.

243. 09:40 – 10:00

244. PAPER TITLE : OPTIMIZED FABRICATION OF BIOPOLYMER-DERIVED
HYBRID AEROGELS AS SMART DRUG CARRIERS

245. AUTHOR(S) : Didem AYCAN, Yaşar Andelib AYDIN, **Müge SENNAROĞLU
BOSTAN**

246.

247. 10:00 – 10:20

248. PAPER TITLE : DEGRADATION MECHANISMS of SELECTED
AMINOPOLYCARBOXYLIC ACID MOLECULES by DFT METHOD

249. AUTHOR(S) : **Bahar EREN**, Ayşe Handan DÖKMECİ

250.

251. 10:20 – 10:40

252. PAPER TITLE : SYNTHESIS AND BIOLOGICAL ACTIVITY OF 1,2,3-TRIAZOLE COUMARIN HYBRIDS

253. AUTHOR(S) : **Petra KOVAČEC**, Leentje PERSOONS, Dirk DAELEMANS, Tatjana GAZIVODA KRALJEVIĆ

254.

255. 10:40 – 11:00

256. PAPER TITLE : NICKEL SULFIDE QUANTUM DOTS ANCHORED ON ZIF-67 AS AN EFFICIENT ELECTROCATALYST FOR HYDROGEN EVOLUTION REACTION

257. AUTHOR(S) : **Yaren ERDAG MADEN**, Özge KERKEZ KUYUMCU

258.

TEA & COFFEE BREAK 11:00 – 11:20

259.

260.

261.

SESSION E (11:20 – 13:00)

SESSION CHAIR: Dr. Bahar EREN

262.

263.

264. 11:20 – 11:40

265. PAPER TITLE : PRODUCTION AND CHARACTERIZATION OF A DOUBLE-LAYERED WOUND DRESSING CONTAINING ELECTROSPUN POLYLACTIC ACID AND HYPERICUM-INFUSED ALGINATE HYDROGEL

266. AUTHOR(S) : **Seniyecan KAHRAMAN**, Seniye UZUN, Emine ÖZBEY, Filiz UĞUR NİĞİZ

267.

268. 11:40 – 12:00

269. PAPER TITLE : FABRICATION OF ACID-MODIFIED CLINOPTILOLITE DOPED PVDF NANOFIBER MEMBRANES AND OPTIMIZATION OF NITRATE ADSORPTION USING RSM

270. AUTHOR(S) : **Ayşenur KATIRCI**, Filiz UĞUR NİĞİZ

271.

272. 12:00 – 12:20

273. PAPER TITLE : SYNTHESIS AND IN VITRO CHARACTERIZATION OF
QUERCETIN-LOADED ALGINATE-KERATIN COMPOSITE
HYDROGELS FOR ENHANCED WOUND HEALING APPLICATIONS

274. AUTHOR(S) : **Sezer YİĞİT**, Tijen Ennil BEKTAŞ, Seniyecan KAHRAMAN, Filiz
UĞUR NİGİZ

275.

276. 12:20 – 12:40

277. PAPER TITLE : FROM ORANGE PEEL TO SUSTAINABLE BIOCOMPOSITE:
PRODUCTION AND CHARACTERISATION OF PECTIN/CMC FILMS
WITH MATCHA TEA EXTRACT

278. AUTHOR(S) : Buse Okay, **Özde İPSALALI**, Filiz Uğur Nigiz

279.

280. 12:40 – 13:00

281. PAPER TITLE : PREPARATION AND CHARACTERIZATION OF
ELECTROSPUN ZR-BASED UIO-66/SULFONATED PPSU PROTON
EXCHANGE MEMBRANES FOR VANADIUM REDOX FLOW
BATTERIES

282. AUTHOR(S) : **Elif ÇOLAK**, Buse ÇETİN, Derya ÜNLÜ, Filiz UĞUR NİGİZ

283.

284.

LUNCH BREAK 13:00 – 14:00

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SESSION F (14:00 – 15:20)
SESSION CHAIR: Prof. Dr. Dolunay ŞAKAR

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296. **14:00 – 14:20**

297. PAPER TITLE : PHENYLBORONIC ACID-ENHANCED BENZOXAZINE RESINS
AS PROMISING MATRICES FOR THERMAL PROTECTION
COMPOSITES

298. AUTHOR(S) : **Ruveyda ÖZDEMİR**, Derya UNLÜ

299.

300.

301. **14:20 – 14:40**

302. PAPER TITLE : SESAMOL-FUNCTIONALIZED CYCLOPHOSPHAZENES:
SYNTHESIS, STRUCTURAL CHARACTERIZATION, AND BIOLOGICAL
EVALUATION

303. AUTHOR(S) : **Şule ŞAHİN ÜN** , Hanife İBİŞOĞLU , Yunus ZORLU , Devrim
ATILLA , Gülşah TOLLU , Ersin KILINÇ , Sadin ÖZDEMİR

304.

305. **14:40 – 15:00**

306. PAPER TITLE : SUSTAINABLE AND BIOACTIVE CHITOSAN/PVA
HYDROGELS INCORPORATING ALLANTOIN FOR WOUND HEALING
APPLICATIONS

307. AUTHOR(S) : **Miray ÖZBAKIŞ**, Dea ISMAILI, Yusuf SICAK, Pınar
TERZİOĞLU

308.

309. **15:00 – 15:20**

310. PAPER TITLE : COMPARATIVE EVALUATION OF INFRARED AND
MICROWAVE DRYING OF BERRIES: KINETICS, DIFFUSIVITY, AND
MODELING APPROACHES

311. AUTHOR(S) : **Ekin KIPÇAK**

312.

313.

TEA & COFFEE BREAK 15:20 – 15:40

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332.

POSTER SESSION B (15:40 – 16:40)

SESSION CHAIRS: Prof. Dr. Emel AKYOL, Prof. Dr. Temine ŞABUDAK, Prof. Dr. Yelda YALÇIN GÜRKAN

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CHEMICAL CHARACTERIZATION OF PM_{2.5} IN THE URBAN AIR OF TIRANA: SOURCES, CHEMICAL MARKERS AND ATMOSPHERIC SECONDARY PROCESSES

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Abstract

This pilot study presents a detailed chemical characterization of fine particulate matter with an aerodynamic diameter of 2.5 micrometres collected in an urban area in Tirana, aiming to identify the sources and atmospheric processes influencing its composition. The analyses of water-soluble ions and carbohydrates indicates that this particulate matter consists of a combination of primary sources and products of secondary transformations. Elevated concentrations of sulphates, nitrates and various organic acids indicate advanced oxidation of organic and inorganic matter. The presence of specific markers such as levoglucosan, mannosan and mannitol suggest contributions from biomass combustion, biological activity, and plant materials. The results demonstrate the complexity of urban particulate matter and highlight the importance of chemical analysis for the assessment of pollutant sources, as well as for supporting receptor models such as positive matrix factorisation in understanding the dynamics of particulate matter with an aerodynamic diameter of 2.5 micrometres in the atmosphere.

Key Words: *Fine particulate matter; chemical composition; water-soluble ions and carbohydrates; primary sources; secondary transformations.*

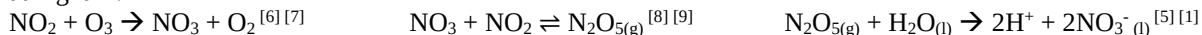
398. Introduction

Particulate matter PM is emitted directly into the atmosphere (primary particles) or is formed in the atmosphere through the transformation of gases into particles (secondary particles).^{[1] [2] [3]} Examples of secondary particle formation from chemical transformations of gases include the formation of nitrates, sulfates^[1] and nitrates formed from the transformations of primary VOCs^[4].

Formation of nitrates: NO₂ reacts with OH groups to form nitric acid (the main homogeneous mechanism of acid formation during the day in the troposphere)^{[5][1]}. $\text{NO}_2 + \text{OH} + \text{M} \rightarrow \text{HNO}_3 + \text{M}$

Nitric acid can be converted to nitrate forms through reactions with ammonia, amines, dust, and sea salts in the aerosol phase. In the urban atmosphere, NH₄NO₃ represents the main chemical form of nitrate in fine particles PM^[1]. $\text{HNO}_3(\text{g}) + \text{NH}_3(\text{g}) \rightleftharpoons \text{NH}_4\text{NO}_3(\text{s})$

Depending on the relative humidity RH, the ammonium nitrate formed in the above reaction exists either in a solid state or as an aqueous solution composed of NH₄⁺ and NO₃⁻ ions. Meanwhile, N₂O₅ plays an important role at night^[3].



Particles with an aerodynamic diameter D_p < 2.5µm are defined as fine particles and are also known as PM_{2.5} particles^[10]. The main sources of PM_{2.5} are traffic, industry, combustion of fuels for domestic use, as well as natural sources such as volcanoes, soil dust and marine aerosols^[11]. Another source of PM_{2.5} is particle formation through the growth of condensable vapors in the atmosphere^[12], during which photocatalytic^[13] and free radical oxidation reactions^[14] occur, increasing the chemical complexity of PM_{2.5}. Determining the chemical composition of PM_{2.5} is essential for understanding new particles formation mechanisms^[10], as PM_{2.5} are characterized by their very small size, large specific surface area and long residence time in the atmosphere^[15]^[1]. PM_{2.5} and its chemical components impair atmospheric visibility by enhancing light scattering and absorption^[10] and pose significant risks to human health^{[16] [17] [18]}. PM_{2.5} is a complex mixture mainly composed of water-

soluble inorganic ions, carbonaceous compounds, and trace elements, with water-soluble inorganic ions account for 20-60% of the particle mass and increasing with increasing pollution levels^[15].

Sulfate (SO_4^{2-}), nitrate (NO_3^-), ammonium (NH_4^+), organic matter (OM), black carbon (BC), and crustal elements are the dominant components of $\text{PM}_{2.5}$ influencing climate^{[19] [20] [21]} by degrading air quality^{[1] [22]} and causing adverse health outcomes^[23]. Carbonaceous compounds EC (BC) and OC mainly originate from biomass, fossil fuels combustion and other carbon-containing materials^[24], with OC comprising diverse organic compounds such as PAHs, saccharides such as levoglucosan, mannosan, etc^[25]. Although $\text{PM}_{2.5}$ has overall mixed effects, its individual components exhibit distinct roles due to their different physicochemical properties; for example, BC mainly absorbs solar radiation, while SO_4^{2-} mainly scatters it, resulting in opposite climate effects; carbonaceous materials are probably more toxic than SO_4^{2-} and therefore have different health impacts^[26]. Trace heavy metals, despite constituting 7-8% of $\text{PM}_{2.5}$ mass, pose significant carcinogenic risks due to their high toxicity and environmental persistence^{[26] [27]}. Organic aerosols (OAs) can contribute up to 75% of $\text{PM}_{2.5}$ mass and significantly affect human health, atmospheric visibility, and climate change^{[28] [22] [29]}, modify particle hygroscopicity due to their water solubility^[30]. Organic aerosols originate from various sources, some of which are emitted directly from the sources (these are called primary organic aerosols POA), while some are formed by being involved in some atmospheric processes (secondary organic aerosols SOA), which are mainly formed by the oxidation of volatile organic compounds (VOCs)^[4].

Carbohydrates are water-soluble organic compounds present in the atmosphere and emitted through biomass burning, soil resuspension, and plant emissions^[31]. Fatty acids are abundant in urban organic aerosols, contribute more than 50% of the organic compounds detected from various emission sources, e.g. biological activities, biomass burning, and cooking activities^{[32] [33]}. Biomass contains oligo- and polysaccharides (e.g. cellulose, lignin, and starch) that generate significant amounts of monosaccharides, disaccharides, sugar alcohols, and anhydro sugars^[34] which are widely used as aerosol biological tracers^{[35] [36]}. Due to their wide distribution and chemical composition sensitive to particle size they offer the possibility to estimate the atmospheric trajectory and sources of aerosol particles^{[37] [38]}. Anhydro sugars levoglucosan, mannosan and galactosan originate from cellulose and hemicellulose combustion and are established biomass-burning markers^{[39] [40] [41]}, while primary saccharides (glucose, sucrose, fructose) are characteristic of materials such as pollen, fruits and plant fragments^[42], while sugar alcohols (mannitol and arabitol) are characteristic of fungal spores^[43].

In this context, chemical composition of $\text{PM}_{2.5}$ is essential for understand particle sources and formation processes. Accordingly, this pilot study presents laboratory analyses of $\text{PM}_{2.5}$ filters collected in Tirana, focusing on inorganic ions and organic compounds as indicators of atmosphere chemical transformations and natural anthropogenic sources.

399. Methodology

$\text{PM}_{2.5}$ samples were collected at an urban background site in Tirana, located in the vicinity of Faculty of Natural Science of the University of Tirana. Sampling campaigns were conducted during two different periods, March-Aprile 2024 and April-May 2025, as part of a pilot study, aimed at characterizing the chemical composition of $\text{PM}_{2.5}$ and identifying key chemical markers, rather than performing quantitative interpretation of detailed interannual comparisons of concentration levels.

Particulate matter samples were collected using low-volume air sampler equipped with Teflon filters, operating over 24- hour at a controlled flow rate $2.3 \text{ m}^3\text{h}^{-1}$, in accordance with standard air quality monitoring procedures^[44] CEN, EN 12341:2014. The sample site was selected to represent urban background conditions, minimizing the influence of immediate point source. Following sampling, filters were weighed before and after collection to determine $\text{PM}_{2.5}$ mass. The water-soluble fraction of this particle was extracted using deionized water and analyzed for major inorganic ions and carbohydrates. Ion chromatography was employed for the determination of cations and anions, while water-soluble carbohydrates were analyzed using high-performance anion-exchange chromatography with pulsed amperometric detection (HPAEC-PAD).

3. Results and Discussion

The analysis of water-soluble ions in $\text{PM}_{2.5}$ particles provides an overview of the inorganic and organic

chemical composition of urban aerosols. Within the framework of this pilot study, the results are interpreted qualitatively, focusing on compositional patterns and the identification of source-related chemical markers, rather than on quantitative evaluation of absolute concentration levels or the relative contributions of individual PM_{2.5} components.

Table 1: Identified cations during the March–April 2024 sampling period

Filters 2024	Volume (m ³)	Sodium (μg/m ³)	Ammonium (μg/m ³)	Potassium (μg/m ³)	Magnesium (μg/m ³)	Calcium (μg/m ³)
1	55.2	1.572	0.396	1.071	0.601	10.196
2	55.2	3.391	0.169	1.084	0.241	1.087
3	55	2.693	2.904	1.686	0.282	3.423
4	55.19	7.691	1.563	4.113	0.791	7.730
5	55.2	1.942	0.501	0.446	0.087	0.514
6	55.2	0.627	1.459	0.912	0.162	1.771
7	54.76	1.755	1.229	0.579	0.162	0.553
8	55.2	1.439	1.353	0.852	0.083	0.455
9	55.2	0.958	4.609	1.042	0.181	2.442

Table 2: Identified cations during the April-May 2025 sampling period

Filters 2025	Volume (m ³)	Sodium (μg/m ³)	Ammonium (μg/m ³)	Potassium (μg/m ³)	Magnesium (μg/m ³)	Calcium (μg/m ³)
1	55.19	1.886	0.528	0.315	0.183	0.608
2	55.2	BDL	BDL	BDL	BDL	BDL
3	55.18	BDL	BDL	BDL	BDL	BDL
4	55.17	0.568	3.222	0.398	0.042	0.364
5	33.9	1.015	4.819	0.493	0.073	0.809
6	55.2	0.374	3.415	3.173	0.513	20.915
7	55.19	1.197	5.606	2.626	0.272	20.163

The presence of the analyzed ions indicates a mixed contribution of natural and anthropogenic sources to PM_{2.5} composition in the urban environment. Na⁺ and Mg²⁺ are mainly associated with marine aerosols with marine aerosols and mineral dust resuspension from road dust and construction activities, reflecting natural sources and atmospheric transport processes^{[15] [45]}. Ca²⁺ is a well-established tracer of soil resuspension and construction-related activities^{[15] [45]}. NH₄⁺ represents secondary aerosol formation through reactions between atmospheric NH₃ and inorganic acids, indicating active chemical transformation processes^[1]. K⁺ is commonly used as a qualitative marker of biomass burning, suggesting contributions from combustion processes of organic materials originating from local or regional sources^[46]. Overall, the ionic composition reflects the combined influence of natural sources, anthropogenic activities, combustion processes and secondary atmospheric formation. Although possible variations cannot be precisely quantified, the presence and qualitative distribution of these ions is consistent with the literature on urban-industrial PM_{2.5} studies^{[15] [46] [45]}.

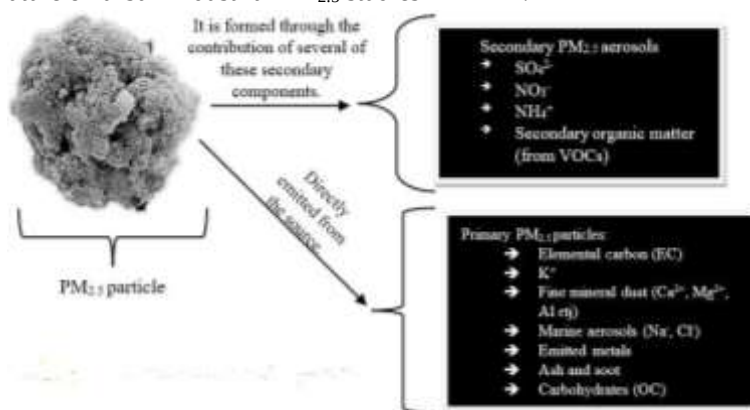


Fig. 1. Composition of a PM_{2.5} particle (PM_{2.5} – Artwork by Bryan Fisher (2016))

Table 3: Identified carbohydrates during the March-April 2024 sampling period.

Filters 2024	Volume (m ³)	Levoglucosan (µg/m ³)	Mannitol (µg/m ³)	Mannosan (µg/m ³)	Galactosan (µg/m ³)	Glucose (µg/m ³)	Mannose (µg/m ³)
1	55.2	3.27 x 10 ⁻⁵	BDL	2.52 x 10 ⁻⁶	5.54 x 10 ⁻⁷	4.13 x 10 ⁻⁷	BDL
2	55.2	BDL	BDL	BDL	BDL	BDL	BDL
3	55	6.21 x 10 ⁻⁵	BDL	4.52 x 10 ⁻⁶	7.96 x 10 ⁻⁷	2.13 x 10 ⁻⁶	BDL
4	55.19	3.52 x 10 ⁻⁶	BDL	4.41 x 10 ⁻⁶	BDL	4.21 x 10 ⁻⁵	BDL
5	55.2	BDL	BDL	BDL	BDL	BDL	BDL
6	55.2	1.79 x 10 ⁻⁵	BDL	2.6 x 10 ⁻⁶	3.36 x 10 ⁻⁷	BDL	BDL
7	54.76	BDL	BDL	BDL	BDL	BDL	BDL
8	55.2	2.25 x 10 ⁻⁵	BDL	5.83 x 10 ⁻⁶	2.28 x 10 ⁻⁷	BDL	BDL
9	55.2	BDL	BDL	3.78 x 10 ⁻⁶	BDL	2.87 x 10 ⁻⁶	BDL

Table 4: Identified carbohydrates during April-May 2025 sampling period.

Filters 2025	Volume (m ³)	Levoglucosan (µg/m ³)	Mannitol (µg/m ³)	Mannosan (µg/m ³)	Galactosan (µg/m ³)	Glucose (µg/m ³)	Mannose (µg/m ³)
1	55.19	0.018	0.001	BDL	8 x 10 ⁻⁴	0.003	BDL
2	55.2	0.047	0.015	BDL	0.002	0.003	5 x 10 ⁻⁴
3	55.18	0.023	7 x 10 ⁻⁴	0.001	9 x 10 ⁻⁴	0.031	0.34
4	55.17	0.024	0.002	BDL	8 x 10 ⁻⁴	0.005	BDL
5	33.9	BDL	0.001	BDL	BDL	0.01	0.007
6	55.2	4 x 10 ⁻⁴	7 x 10 ⁻⁴	BDL	BDL	0.008	BDL
7	55.19	BDL	BDL	2 x 10 ⁻⁴	1.08 x 10 ⁻⁵	0.006	5 x 10 ⁻⁴

Water-soluble carbohydrates detected in PM_{2.5} samples from 2024 and 2025 include levoglucosan, mannitol, mannosan, galactosan, glucose, and mannose, which are widely used tracers of organic aerosol sources. Levoglucosan is well-established global marker of biomass burning from wood, agricultural residues, and plant material combustion [47][48][49]. Mannosan and galactosan, formed during hemicellulose pyrolysis, act as auxiliary indicators of ligno-cellulosic material combustion, with mannosan also supporting the identification of softwood burning sources [42][47][48][49]. Mannitol represents a characteristic biomarker of fungal spores and biological activity, while glucose and mannose reflect contributions from plant material, pollen and microbial sources [42][43][50].

The anionic composition (tables 5&6) further highlights the combined influence of primary emissions and secondary atmospheric processes, providing insight into aerosol origin and oxidative transformations.

Sulphates and nitrates constitute the dominant secondary fraction of PM_{2.5}, formed through oxidation of SO₂ and NO_x and reflecting anthropogenic emissions and advanced photochemical processes [3][1][4]. Dicarboxylic acids such as oxalate, malonate, and succinate further indicate intensive multi-step oxidation of organic matter involving VOCs, including biogenic hydrocarbons and terpenes [51]. Chloride derives from biomass burning industrial activities, waste and marine aerosols, and releasing gaseous HCl [52][53]; chloride-containing aerosols are important components of fine particulate in industry, marine and biomass burning environments [54][55]. Nitrite formed via heterogeneous NO₂ reactions on particle surface, is unstable and rapidly oxidized to nitrate, providing insight into short-time atmosphere processes [5]. Fluoride occurs at trace levels in PM_{2.5} and is mainly associated with coal combustion and industrial emissions involving fluorinated compounds such as PFAS [56].

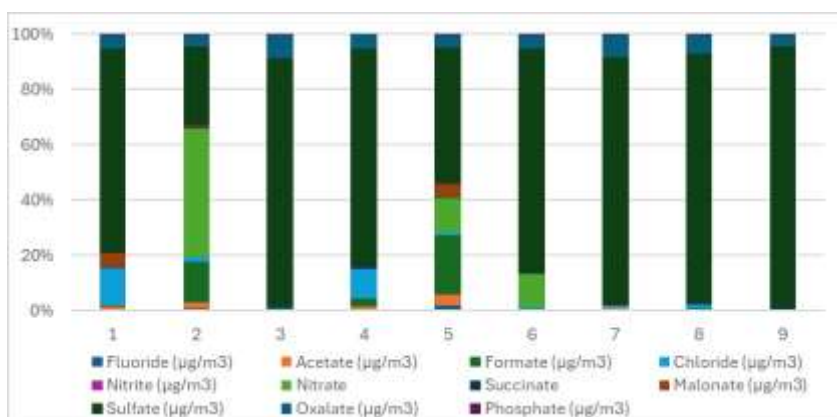


Figure 1. Relative composition of anions in PM_{2.5} samples during March-April 2024.

As this study represents a pilot investigation, the focus was not placed on detailed quantitative interpretation. Nevertheless, the dominant pollutant can still be identified based on its relative contribution. It should be noted that the 2024 filters were stored under controlled temperature and isolated conditions; however, considering the different stability and lifetime of atmospheric species, partial losses or transformations—particularly for more volatile or reactive compounds—may have occurred during storage. Therefore, the results should be interpreted primarily in terms of relative composition rather than absolute concentration.

Among the analyzed species, sulfate is clearly observed as the dominant component in the 2024 samples, accounting for the highest relative contribution across all filters.

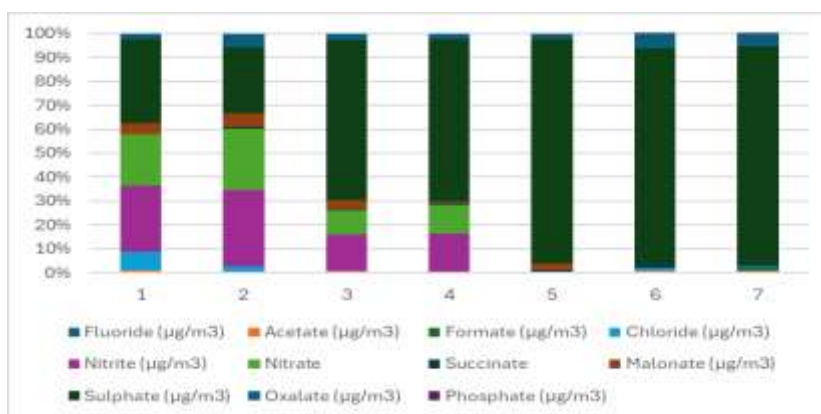


Figure 2. Relative composition of anions in PM_{2.5} samples during April-May 2025

The relative contribution (%) of measured anions in PM_{2.5} samples collected during 2025 is presented. Sulfate remains the dominant species across all samples, while other ions such as nitrate, chloride, and organic acids show variable but lower contributions. Values below detection limit (BDL) were treated as zero.

Conclusion

The investigation of the chemical composition of PM_{2.5} demonstrated that the analysis of inorganic and organic species is essential for the identification of particulate matter sources through receptor models such as Positive Matrix Factorization (PMF). The results revealed that PM_{2.5} is not composed solely of primary emissions, but it's largely formed through secondary transformations of primary gaseous pollutants, particularly via the oxidation of SO₂, NO_x, volatile organic compounds etc. This highlights the importance of monitoring primary

pollutions, as their abundance and reactivity largely determine the potential for PM_{2.5} formation in the atmosphere. The presence of sulfates, nitrates and dicarboxylic acids indicate advanced oxidation of both inorganic and organic matter, while specific tracers such as levoglucosan, mannosan, and mannitol identify contributions from biomass burning, biological activity, and plant-derived sources. In addition, ions such as Na⁺, Ca²⁺, K⁺, and NH₄⁺ reflect combined influences from urban and natural sources, as well as secondary atmospheric processes involving chemical transformations.

Overall, this study demonstrates that PM_{2.5} in urban environments represents a complex mixture arising from the interaction between atmospheric chemical processes and natural and anthropogenic sources. These findings emphasize the necessity of a multidisciplinary approach in the assessment and management of air quality.

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