21 Ružičkini dani
DANAS ZNANOST – SUTRA INDUSTRIJA
9. – 11. rujna 2026. • Vukovar • Hrvatska

J. J. Strossmayer University of Osijek
Department of chemistry
Cara Hadrijana 8A
31000 Osijek
Croatia

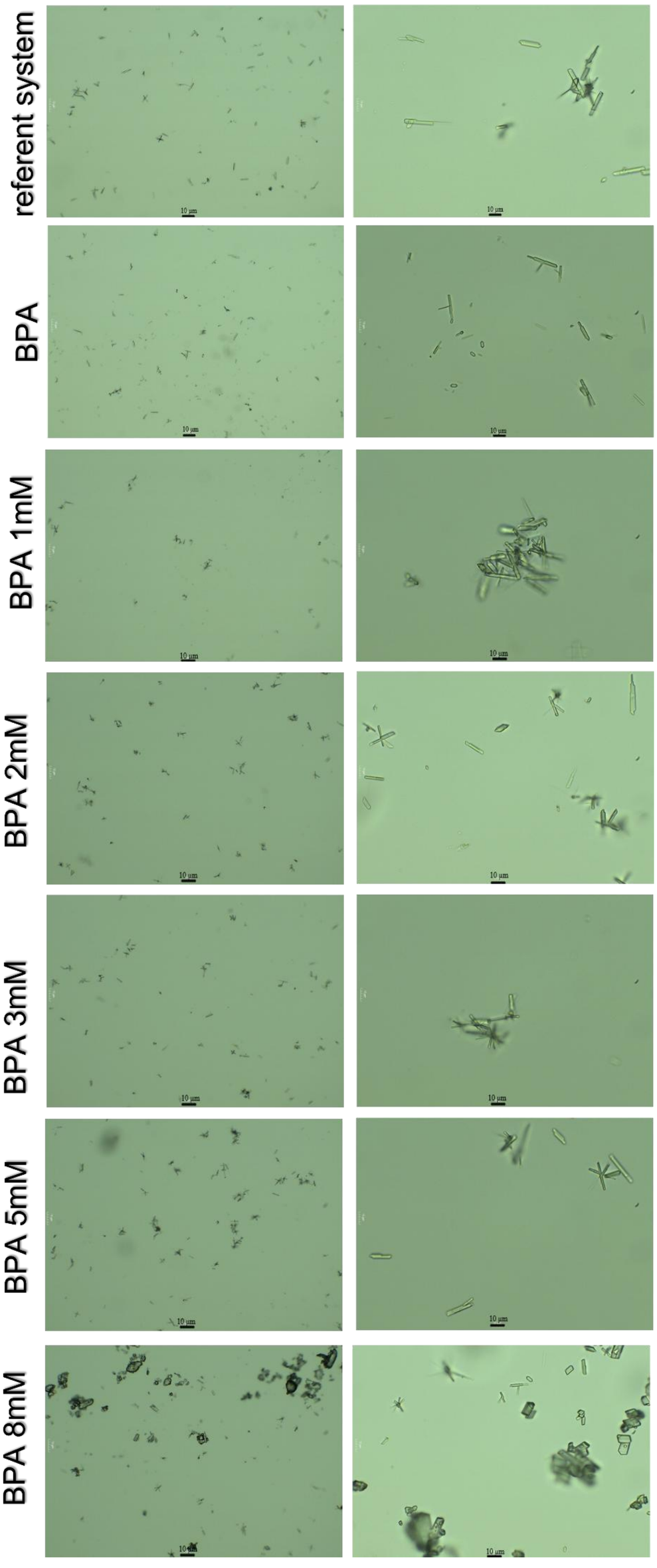
Role of Bisphenol A in Modulating Calcium Oxalate Precipitation

Jelena Ivanović[1], Nikolina Filipović[1], Jelena Brdarić[1], Ana Amić[1], Nives Matijaković Mlinarić[2], Anamarija Stanković[1]

[1]Department of Chemistry, University of Osijek, Ulica cara Hadrijana 8/A, 31 000 Osijek, Croatia
[2]Laboratory for Precipitation Processes, Ruđer Bošković Institute, Bijenička cesta 54, 10 000 Zagreb, Croatia

INTRODUCTION & AIM

Calcium oxalate (CaOx) is the predominant mineral component of human kidney stones, and its nucleation, growth, aggregation, and phase transformations are key processes in urolithiasis [1,2]. Bisphenol A (BPA), a widespread environmental contaminant originating from plastics and epoxy resins, may interact with ionic species and crystal surfaces, potentially affecting biomineralization and crystallization processes [3]. However, the influence of BPA on CaOx crystallization and phase evolution remains insufficiently understood.
Aim: To investigate the effect of BPA on CaOx precipitation, focusing on crystal morphology, aggregation, phase composition, and potential interactions between BPA and individual precipitation components.



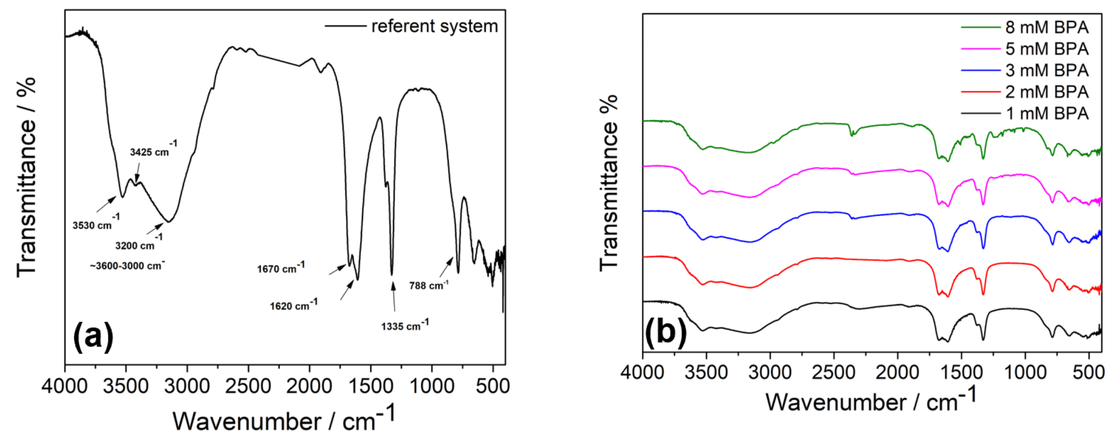
Microscopic images of COT crystals in the referent system and in the presence of BPA at concentrations of 1, 2, 3, 5, and 8 mM at ×10 and ×40 magnification

RESULTS & DISCUSSION

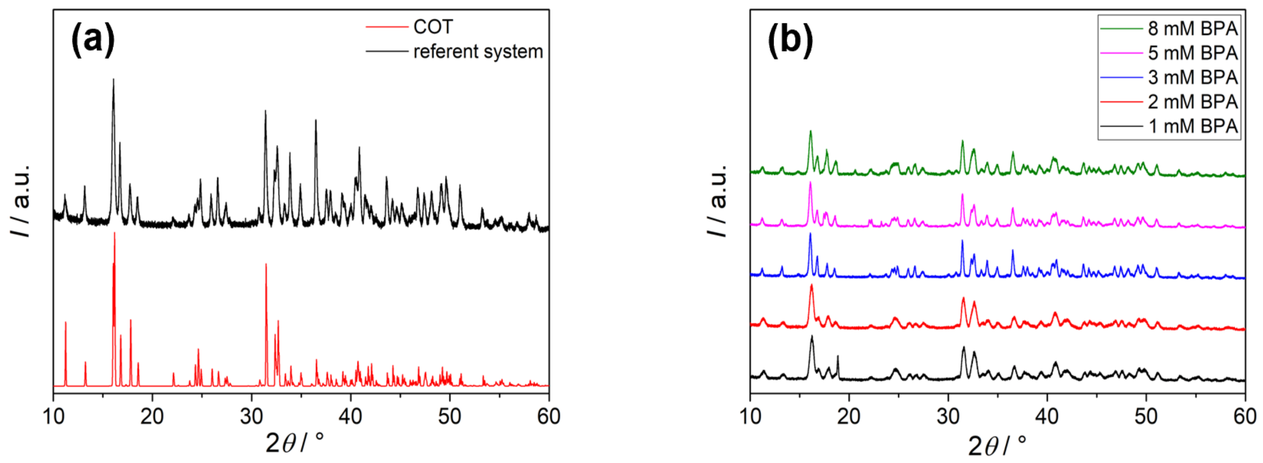
In the reference system, COT crystals were relatively uniformly dispersed. BPA promoted crystal aggregation and induced changes in crystal size and morphology, indicating an influence on crystal growth.
PXRD and FTIR analyses confirmed COT as the predominant phase during the initial precipitation period. UV–Vis spectra showed a progressive decrease in absorbance upon addition of Ca^{2+} or oxalate, suggesting weak or selective interactions between BPA and the precipitation components.

METHOD

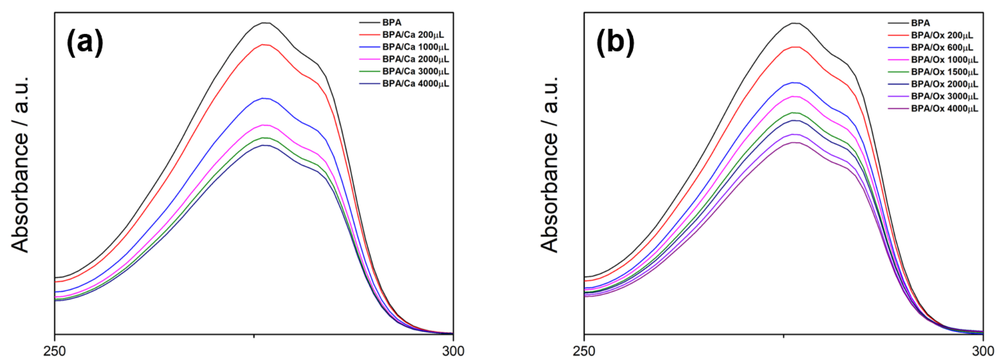
CaOx precipitation was investigated in the absence and presence of BPA under physiologically relevant conditions. Crystal morphology and aggregation were evaluated by light microscopy, while phase composition was characterized by PXRD and FTIR. UV–Vis spectroscopy was used to investigate potential interactions between BPA and the individual precipitation components (Ca^{2+} and oxalate).



FTIR spectra of CaOx precipitates: (a) referent system, and (b) different BPA concentrations (1, 2, 3, 5, and 8 mM)



PXRD patterns of CaOx precipitates: (a) referent system and COT, and (b) different BPA concentrations (1, 2, 3, 5, and 8 mM)



UV–Vis spectra of BPA with increasing amounts of (a) Ca^{2+} and (b) oxalate

CONCLUSIONS

BPA promotes aggregation and alters the size and morphology of CaOx crystals, indicating an influence on crystal growth. COT is the predominant phase during the initial precipitation period. UV–Vis results suggest weak or selective interactions between BPA and Ca^{2+} and oxalate species. Overall, BPA modulates CaOx crystallization by affecting crystal growth, aggregation, and phase evolution.

FUNDINGS/REFERENCES

This research was funded by the European Union–NextGenerationEU Project “Advanced Interdisciplinary Approaches to Environmental Chemistry: From Materials to Sustainable Solutions for Pollution” (Grant No. 581-UNIOS-101).

[1] A. Khan, M. S. Pearle, W. G. Robertson, G. Gambaro, B. K. Canales, S. Doizi, O. Traxer, H. G. Tiselius, Nat. Rev. Dis. Primers 2 (2016) 16008.
[2] R. Nazarian, N. Lin, S. Thaker, R. Yang, G. C. L. Wong, K. B. Scotland, Uro 5 (2025) 6.
[3] I. Cimmino, F. Fiory, G. Perruolo, C. Miele, F. Beguinot, P. Formisano, F. Oriente, Int. J. Mol. Sci. 21 (2020) 5761.