

Environmental Chemistry for a Sustainable World

Volume 56

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Editors

Deep Eutectic Solvents for Medicine, Gas Solubilization and Extraction of Natural Substances

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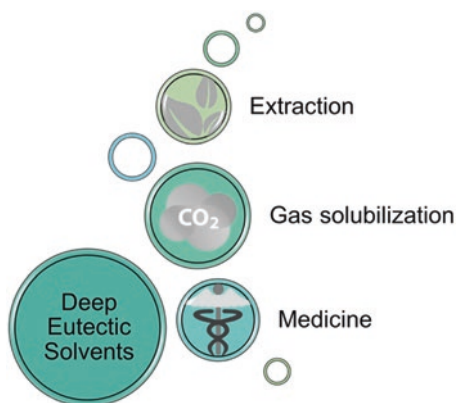
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Preface

Similia similibus solvuntur – Like dissolves like. Anonymous

This aphorism is used to explain that polar solvents dissolve polar solutes, whereas non-polar solvents dissolve non-polar solutes. It appeared in the *Corpus Pharmaceutico-Chymico-Medicum Universale* in 1711.

Deep Eutectic Solvents (DES) are liquid mixtures at ambient conditions, for which the eutectic point temperature is lower than that of the ideal mixture. Initially considered as a sub-class of ionic liquids, eutectic mixtures are formed by low cost, often biodegradable Lewis or Bronsted acids and bases. As a consequence, a large number of possible deep eutectic solvents can be designed and synthesized for green chemistry. DES have thus recently attracted academic and industrial interest for various applications such as metal processing, biomass treatment and pharmaceuticals. Since the expression Deep Eutectic Solvent was coined in Prof. Abbott's paper in 2003, the number of related publications has increased exponentially, reaching about one thousand in 2019. This book gathers contributions by the most active research groups that use eutectic mixtures for separation, extraction and medical applications. The reader will discover ground-breaking results in different disciplines.



The first chapter by El Achkar et al. presents an overview of DES and their physicochemical properties. Chapter 2 by Nguyen et al. reviews pharmaceutical applications and toxicity of DES for living organisms and the environment. A new system prepared with an active pharmaceutical ingredient, named therapeutic deep eutectic systems (THEDES), is described by Filipa Santos and Ana Rita C. Duarte in Chap. 3. Understanding of how DES dissolve various solutes is of major importance for further use, as explained in Chap. 4 by Moura et al. who review the solubility of gases in DES. Chapter 5 by Byrne et al. discloses new hydrophobic DES, formed by mixing fatty acids with ammonium or phosphonium salts, thus conferring hydrophobicity without fluorinated species. These solvents appear promising for gas capture and liquid-liquid extraction. Chapter 6 by Nakhle et al. presents extraction methods that use deep eutectic solvents. Then, extraction of polyphenols by DES and a review of recent DES applications is presented by Percevault et al. in Chap. 7.

The editors extend their thanks to all the authors who contributed to this book for their efforts in producing timely and high-quality chapters. The creation of this book would not have been possible without the assistance of several friends deserving acknowledgment. They have helped by choosing contributors, reviewing chapters and in many other ways. Finally, we would like to thank the staff at Springer Nature for their highly professional editing of the book.

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About the Editors



Sophie Fourmentin works at Université du Littoral Côte d'Opale, Dunkerque, France. She conducts research on the interface between supramolecular chemistry and environmental chemistry. Her group first published a paper on deep eutectic solvent with supramolecular properties in 2019. Prof. Fourmentin supervised and/or co-supervised 12 PhD students, 20 Master students and 2 postdoctoral fellows. She has now 122 publications listed in Scopus, with a total of 2441 citations and an h-factor of 31. Prof. Fourmentin also holds a patent and coordinated three books. She is the President of the French Cyclodextrin Society.



Margarida Costa Gomes is a Physical Chemist and Chemical Engineer working at the French National Centre for Scientific Research in Lyon, France. Her current research interests in the field of molecular thermodynamics of fluids and solutions aim to contribute to greener and more sustainable chemical processes by using environmentally friendly solvents like ionic liquids or eutectic mixtures. She was awarded the CNRS Bronze Medal and was an invited Researcher at the Institute of Chemical and Biological Technology, Portugal, and she is a visiting scholar at the Massachusetts Institute of Technology, USA, where she maintains a position as Research Affiliate. Prof. Costa Gomes has supervised or co-supervised 26 PhD theses and 19 postdoctoral researchers and has published more than 140 papers with a WoS h-index of 42.



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