



Universiteit
Leiden
The Netherlands

Natural deep eutectic solvents and their application in natural product research and development

Dai, Y.

Citation

Dai, Y. (2013, September 24). *Natural deep eutectic solvents and their application in natural product research and development*. Retrieved from <https://hdl.handle.net/1887/21787>

Version: Corrected Publisher's Version

License: [Licence agreement concerning inclusion of doctoral thesis in the Institutional Repository of the University of Leiden](#)

Downloaded from: <https://hdl.handle.net/1887/21787>

Note: To cite this publication please use the final published version (if applicable).

Cover Page



Universiteit Leiden



The handle <http://hdl.handle.net/1887/21787> holds various files of this Leiden University dissertation.

Author: Dai, Yuntao

Title: Natural deep eutectic solvents and their application in natural product research and development

Issue Date: 2013-09-24

Natural Deep Eutectic Solvents and their application in natural product research and development

Yuntao Dai

Yuntao Dai

**Natural Deep Eutectic Solvents and their application in
natural product research and development**

Ph.D Thesis, Leiden University,

ISBN: 978-90-821172-0-2

Printed by Smart Printing Solution, www.sps-print.eu

Natural Deep Eutectic Solvents and their application in natural product research and development

PROEFSCHRIFT

ter verkrijging van
de graad van Doctor aan de Universiteit Leiden,
op gezag van Rector Magnificus prof. mr. C.J.J.M. Stolker,
volgens besluit van het College voor Promoties
te verdedigen op woensdag 24 Sep 2013
klokke 10:00 uur

door

Yuntao Dai

Shanxi Province (China)

in 1981

Promotiecommissie

Promotor: Prof. Dr. R. Verpoorte
Promotor: Prof. Dr. G-J. Witkamp (TU Delft)
Co-promotor: Dr.Y.H. Choi

Overige leden: Prof. Dr. H.Bakker (AMOLF, Amsterdam)
Prof. Dr. T. Odijk (LION, Leiden)
Prof. Dr. C.J. ten Cate
Prof. Dr. P.G.L. Klinkhamer

To the whole society

Contents

Chapter 1	General Introduction	1
Chapter 2	Liquefied mixtures of solids can extract natural products: application of ionic liquids and deep eutectic solvents to natural product research	5
Chapter 3	Natural Deep Eutectic Solvents as new potential media for green technology	61
Chapter 4	The effect of water content on the characteristics of Natural Deep Eutectic Solvents	81
Chapter 5	Natural Deep Eutectic Solvents providing enhanced stability of natural colourants from safflower (<i>Carthamus tinctorius</i>)	99
Chapter 6	Natural Deep Eutectic Solvents facilitating the extraction and storage of anthocyanins	117
Chapter 7	Natural Deep Eutectic Solvents as new extraction media for phenolic metabolites	133
Chapter 8	Natural Deep Eutectic Solvents in plants and plant cells: <i>in-vitro</i> evidence for their possible functions	149
Chapter 9	Concluding remarks and prospective	171
	Summary	175
	Samenvatting	179
	Acknowledgements	183
	Curriculum Vitae	185
	List of Publications	186