

青阳非金属矿研究院
浙江工业大学化学工程学院等

组织编写

超分子化学、纳米技术与 非金属矿功能材料

SUPRAMOLECULAR CHEMISTRY, NANOTECHNOLOGY &
FUNCTIONAL INDUSTRIAL MINERAL- BASED MATERIALS

周春晖 Kim Yang 余承忠 何宏平 主编

中国建材工业出版社

超分子化学、纳米技术与 非金属矿功能材料

SUPRAMOLECULAR CHEMISTRY,
NANOTECHNOLOGY &
FUNCTIONAL INDUSTRIAL
MINERAL-BASED MATERIALS

周春晖 Kim Yang 余承忠 何宏平 主编

贵州师范学院内部使用

中国建材工业出版社

图书在版编目(CIP)数据

超分子化学、纳米技术与非金属矿功能材料:英文/
周春晖等主编. --北京:中国建材工业出版社,2019.10
ISBN 978-7-5160-2662-5

I. ①超… II. ①周… III. ①非金属矿-功能材料-
研究-英文 IV. ①TB34

中国版本图书馆CIP数据核字(2019)第183433号

内容简介

本书较全面、及时地反映了超分子化学、纳米技术与非金属矿领域的科学前沿、新兴技术和前瞻产业。具体内容包括:超分子化学、纳米和非金属矿若干科技前沿和新兴产业,超分子化学、超分子结构材料和应用,纳米化学、催化技术和新能源材料,纳米技术与生物技术、土壤和环境,非金属矿清洁增值加工技术和功能材料,非金属矿纳米化学、结构和应用,超分子化学、纳米材料与非金属矿的交叉融合等。

本书可供超分子化学、纳米技术与非金属矿及相关的建材、化工、轻工、医药、能源、冶金、农业、地球环境、生态保护等行业科研人员和管理人员阅读和参考,对从事超分子化学、纳米技术与非金属矿物科学技术及相关产业经济绿色发展的国内外研究人员具有重要学术与技术开发参考价值。

超分子化学、纳米技术与非金属矿功能材料

Chaofenzi Huaxue, Nami Jishu yu Feijinshukuang Gongneng Cailiao

出版发行:中国建材工业出版社

地址:北京市海淀区三里河路1号

邮编:100044

经销:全国各地新华书店

印刷:北京天恒嘉业印刷有限公司

开本:787mm×1092mm 1/16

印张:20

字数:490千字

版次:2019年10月第1版

印次:2019年10月第1次

定价:298.00元

本社网址:www.jccbs.com,微信公众号:zgjcgyCBS

请选用正版图书,采购、销售盗版图书属违法行为

版权专有,盗版必究。本社法律顾问:北京天驰君泰律师事务所,张杰律师

举报信箱:zhangjie@tiantailaw.com 举报电话:(010)68343948

本书如有印装质量问题,由我社市场营销部负责调换,联系电话:(010)88386906

PREFACE

To know the road ahead, ask those coming back.

—Chinese proverb —

Today, the world has become more globalized, science more interdisciplinary, and technology increasingly contributes to human society, with nano and supramolecular chemistry and industrial minerals playing an ever-expanding role.

The ISNSC (International Symposium on Nano & Supramolecular Chemistry) was initiated in October 2007 in Busan, and was most recently held in Bali (Indonesia, 2014), Busan (Korea, 2015), Brisbane (Australia, 2016), Naples (Italy, 2017), and Dresden (Germany, 2018).

Now, during October 12-16, 2019, we welcome all delegates to the pleasant October mildness of Qing Yang, Anhui, alongside the scenic UNESCO's World Geopark, to attend and enjoy the 11th ISNSC and participate in discussions on nano and supramolecular chemistry as well as on green and sustainable science and technology involving industrial minerals.

Nano and supramolecular chemistry are expanding areas of modern science and technology that span many areas. These include nanoporous materials; supramolecular materials including natural supramolecular materials; nano-catalysis; battery and energy nanomaterials; opto-electronic materials as well as a range of nano-biomedical materials.

An aspect that makes the present ISNSC unique is that it is also being held in association with the Third Forum on Industrial Minerals (WFIM-3). This forum has a focus on nano-minerals science and engineering, nanogeoscience; supramolecular assembly of nano-minerals and related hybrids and composites, including eco-friendly mineral nanomaterials, functional mineral/polymer nanocomposites and biomass/mineral nanocomposites. The combination of the International Symposium on Nano & Supramolecular Chemistry and the Forum on Industrial Minerals fosters new opportunities for collaboration across both fields, as well as between delegates from industry and academia in accord with the overall theme of this joint meeting: "Fusion of Supramolecular Chemistry, Nanotechnology and Industrial Mineralogy".

Multidisciplinary knowledge and collaboration are clearly important for promoting the next advances in the design and preparation of nano and supramolecular materials and are also at the core of the interpretation and understanding of the interrelationships between preparation, structure, function and application. Without a doubt, a rather extensive territory remains to be explored if one considers the great diversity (and potential versatility) originating from the 1D, 2D, and 3D structures of industrial minerals as well as of nano and supramolecular

systems. Block, quantum dot, and nanoscale architecture design all entail limitless possibilities and strategies involving industrial minerals.

As they are solved, the tough challenges currently confronting researchers in supramolecular chemistry, nanotechnology and industrial mineralogy become the upcoming opportunities ahead.

All in all, the organizers offer a huge thanks to all delegates who have chosen to take part in the present joint meeting. We hope that your participation will foster both collaboration and continuing innovation in your future work and aid the creation of alternative solutions to many of the challenges currently facing our society.

Honorary Chairs: Leonard F. Lindoy, G. Q. Max Lu, Xiaonian Li

ISNSC-11 Chair: Chunhui Zhou

ISNSC-11 Co-Chairs: Yang Kim, Chengzhong (Michael) Yu,

Martino Di Serio, Artur Stefankiewicz

WFIM-3 Chair: Hongping He

WFIM-3 Co-Chairs: Hongting Zhao, Tianhu Chen, Chunhui Zhou, Leyao Zhou, Xiping Luo

“知之者 不如好之者 好之者 不如乐之者”

——《论语》

Those who know are worse than those who like;
those who like are worse than those who enjoy.

序 言

当前,经济和社会全球化发展,科学研究和技术开发多学科交叉融合,新兴科技对人类社会和人民生活提升和高质量发展的贡献令人瞩目。其中,纳米、超分子化学和非金属矿发挥的作用不可或缺,且日益增强。

第一届国际纳米和超分子化学会议(ISNSC)于2007年10月在釜山召开。最近五届ISNSC分别召开于巴厘(印度尼西亚,2014年)、釜山(韩国,2015年)、布里斯班(澳大利亚,2016年)、那不勒斯(意大利,2017年)和德累斯顿(德国,2018年)。2019年10月13日,在景色宜人的安徽省青阳县,在山清水秀的联合国教科文组织认定的九华山世界地质公园旁边,“第十一届国际纳米和超分子化学会议(ISNSC-11)”和“第三届非金属矿科技和产业论坛(WFIM-3)”一起盛大开幕。我们热烈欢迎各位嘉宾参加本届ISNSC,共同研讨纳米、超分子化学、非金属矿等科学和技术的新进展、新挑战。

纳米和超分子化学正在渗入和交融于众多领域,涉及纳米孔材料、天然生物材料、纳米催化剂、新型电池和新能源材料、光电智能材料、生物医学材料、航空航天材料等。与“第三届非金属矿科技和产业论坛(WFIM-3)”并同召开是本届“ISNSC-11”的重要特点之一。因此,除传统的纳米和超分子化学外,本次会议还聚焦于非金属矿矿物超分子化学、非金属矿矿物纳米化学及相应的工程技术、纳米地球科学、非金属矿矿物的杂化和超分子组装。随着这些基础科学研究的进步,正涌现一系列的新型环保矿物纳米材料、多功能矿物/聚合物纳米复合材料和生物质/矿物纳米复合材料等新兴产业技术和产品链。毋庸置疑,按照本届会议主题“超分子化学、纳米技术与非金属矿产业的交叉融合”,“国际纳米和超分子化学会议”与“非金属矿科技和产业论坛”的联合,成为学术界和产业界提供跨领域合作的新机遇。

显然,多学科知识交融和多学科技术协作能更好地促进纳米、超分子和非金属矿矿物化学的发展,推进纳米、超分子和非金属矿矿物材料的设计、制备和生产,能更加深入和准确地理解和解释制备、结构、功能和应用之间化学本质关系。非金属矿的天然性、多样性、可人工合成、可改性和多功能性,以及其在一维、二维和三维层次上的超分子和纳米结构特性,非金属矿与超分子化学、纳米技术结合,产生了亟待探索的广阔科学技术空间和产业前景。在功能性模块材料、量子点和纳米多级结构材料等领域,更是蕴藏着无限的创造策略、科学智慧和新产业。

我们相信,超分子化学、纳米技术和非金属矿矿物学的科学家们所面临的严峻挑

战,正是未来的机遇。

衷心感谢所有参与组织、研讨和出席本次会议的所有人员!期待本次会议能够有助于各位的合作、创新和友谊,共同应对当前人类社会所面临的诸多科学与技术挑战,齐心协力寻求最佳的科学技术解决方案。

名誉主席: Leonard F. Lindoy, 逯高清, 李小年

ISNSC-11 主席: 周春晖

共同主席: Yang Kim, 余承忠, Martino Di Serio, Artur Stefankiewicz

WFIM-3 主席: 何宏平

共同主席: 赵红挺, 陈天虎, 周春晖, 周乐尧, 罗锡平

“知之者 不如好之者 好之者 不如乐之者”

——《论语》

前 言

“第三届非金属矿科技和产业论坛 (The Third Forum on Industrial Minerals, WFIM-3)”和“第十一届国际纳米和超分子化学会议 (ISNSC-11)”并于2019年10月12—16日在中国安徽省青阳县召开。

本次论坛的主题是“超分子化学、纳米技术与非金属矿产业的交叉融合”。本着开放包容和社会公益的宗旨,秉持绿色矿山、资源节约、清洁加工等技术和产业可持续发展的理念,本次论坛集聚世界范围内的超分子化学、纳米技术与非金属矿专家学者,交流超分子化学、纳米技术与非金属矿及相关领域的学术研究前沿和动态,共同探讨当前面临的科学问题和新技术进展,切磋超分子化学、纳米技术与非金属矿基础科学和产业中的难题,寻求可能解决方案,促进超分子化学、纳米技术与非金属矿等学科的交叉融合,推动国际性的产学研一体化合作,推进学术交流、技术创新和产业升级,助力科技引领发展绿色、高值化的非金属矿加工业和产业链。

论坛面向前沿科技、新兴产业,面向经济和社会的可持续发展,推动政、企、商、民、专家学者之间的广泛交流与国际合作,提供相关政府部门、企业、投融资、科技专家学者等多界共商非金属矿科技、经济、社会、环境及其他相关问题的信息交流和对话平台,共同增强国内业界与世界其它国家地区的非金属矿科技和经济对话、联系和合作,协同拓展非金属矿科技成果跨区域转移扩散、转化和产业化空间。

本届论坛得到中外科研人员的积极响应、支持和参与。有来自国内众多的高校和科研院所的科研人员、企业人员和政府有关部门人员等,有来自澳大利亚、智利、日本、德国、葡萄牙、俄罗斯、瑞士、新加坡、韩国、南非、英国、美国、意大利、伊朗、印度、印度尼西亚、波兰、阿根廷、赞比亚等国家或地区的国际科学家和学者。

此系列“非金属矿科技和产业论坛”系全公益性质。首届论坛由当时的安徽省青阳县经济和信息化委员会、青阳县科学技术局、酉华镇人民政府、青阳非金属矿研究院、中国矿物岩石地球化学学会第9届矿物物理矿物结构专业委员会共同发起,于2017年10月28日—31日在青阳县“五溪山色”成功召开,标志着论坛的正式启动和运行。首届论坛主题是“非金属矿科技与产业的联动”,首届论坛主席是中国科学院广州化学所何宏平研究员和浙江工业大学化学工程学院周春晖研究员。第二届世界非金属矿科技和产业论坛 (WFIM-2)于2018年10月20—23日在青阳县“荣玺庄园酒店”召开,主题是“非金属矿学术前沿和绿色高新技术”。

论坛选址安徽省青阳县为论坛常规所在地,亦称“青阳论坛”,英文简写标识为WFIM。安徽省青阳县非金属矿产资源非常丰富,其中“三石”(石灰石、方解石、白云石)

资源储量巨大,特别是酉华镇及周边地域的石灰石以质优量大闻名于国内外,资源储量位居全国前列。青阳县酉华镇是安徽省政府认定的“安徽省非金属矿采选及深加工产业集群镇”。青阳县境内及周边区域,其他非金属矿产花岗岩、粘土矿物、页岩等储量也十分丰富,各类非金属矿及制品的生产企业和从业人员众多。

非金属矿是与人类生产、生活密切相关的重要矿产资源之一,在当前的工业生产和社会生活占有重要地位,广泛应用于化工、石油、造纸、冶金、建筑、机械、农业、环保、医药、保健等行业,正越来越多地被用于能源、国防、航天、通信、智能材料等高科技领域。据称当今世界非金属矿物用量和产值增长速度已超过了金属矿产,其开发利用水平已成为衡量一个国家科学技术发展水平和人民生活水平的重要标志之一。非金属矿科学技术不仅在工业生产中十分重要,而且非金属矿的科学研究涉及地球和矿物形成、古气候和环境演化、外星球探索、生命起源等重大科技前沿领域,具有重大科学意义和作用。

青阳非金属矿研究院系正式登记注册的、非企业性质的、公益性的科技机构,理念和宗旨为“*Qingyang Institute for Industrial Minerals (QYIM): A non-profit research and development (R&D) institution dedicated to the advancement and promotion of science and technology of industrial minerals and related areas for making the world green, sustainable, and better.*”青阳非金属矿研究院办院和运行坚持定位作为非营利性、开放式、协同创新的学术研究、技术开发和交流合作的平台,携手非金属矿领域及相关的地质、矿物、化工、材料、生物医药、农业、环保、日化等领域的科学研究人员、学者、企业家、企业技术人员等,共同促进和提升非金属矿及相关领域的科学研究、技术开发、成果转化、产品开发、应用推广、科普、教育和文化建设等。在此恳请大家给予青阳非金属矿研究院更多支持并经常性开展合作、交流,共同投身和见证非金属矿产学研的发展,为地方、国家和社会可持续发展做出应有的贡献。

本届论坛设置的议题有:超分子化学;超分子材料和应用;天然超分子产物(林业产品和生物质等);纳米化学;纳米孔、纳米片材料;纳米催化;光、电、磁、声、热纳米材料;纳米医学材料;超分子化学、纳米技术与非金属矿与现代农林牧渔业、地球环境、生态保护;纳米矿物;纳米地球科学;非金属矿的超分子结构和组装;非金属矿/聚合物复合功能纳米材料;纳米矿物和生物质复合物材料;超分子化学、纳米技术、非金属矿与新型化工、轻工、建材、能源、冶金、生物医药、生态保护、地球环境和星球探索等。本次论坛基本展示了超分子化学、纳米技术与非金属矿领域的学术研究新成果和新工程技术,反映了当前超分子化学、纳米技术与非金属矿的基础科学和应用开发的研究水平和前沿动态,辅以论文摘要集《超分子化学、纳米技术与非金属矿功能材料》正式出版,既有利于论坛现场交流,也有利于超分子化学、纳米技术与非金属矿科学研究、教学、生产和应用等相关人员的后续交流。

本届论坛得到了浙江工业大学、杭州电子科技大学、浙江省地质矿产研究所国土资源部粘土矿物重点实验室、浙江农林大学等单位或部门的鼎力相助,也得到了丹东百特仪器有限公司、上海净景环境科技有限公司、杭州昱森医疗器械有限公司等单位的热情支持。此外,青阳非金属矿研究院的国际和国内学术委员会成员、理事、监事、朋友们等给予了诸

多关怀、指导和帮助,在此深表谢意。

在本论文摘要集《超分子化学、纳米技术与非金属矿功能材料》的出版过程中,出版社编辑人员给予了辛勤的、高效的文稿编辑工作和劳动,在此表示感谢。由于时间仓促、水平有限,在各章下有些内容不能完全贴切对应标题或议题,每章标题英文多采用意译,这一方面是由于科学研究交叉性或依据作者投稿所选的议题所造成,另一方面也可能是因本书统筹整理过程中存在一些疏忽和编者水平有限,恳望作者、读者和同行谅解和不吝指正。

特别感谢国内外非金属矿、超分子化学、纳米技术及相关领域科研人员的积极投稿、参与、支持和协助。

第三届非金属矿科技和产业论坛组委会

青阳非金属矿研究院

池州非金属矿产业技术创新战略联盟

2019年10月



“Qingyang Institute for Industrial Minerals (QYIM): A non-profit research and development (R&D) institution dedicated to the advancement and promotion of science and technology of industrial minerals and related areas for making the world green, sustainable and better.”

青阳非金属矿研究院：公益性、非企业性质、非营利性的科技机构；作为开放、协同创新的科学研究、技术研发、科技交流和合作平台，携手非金属矿领域及相关的地质、矿物、化工、材料、生物、医药、农业、环保、日化等领域的科学研究人员、学者、企业家、企业技术人员等，共同促进和提升非金属矿及相关领域的科学研究、技术开发、成果转化、产品开发、应用推广、国际合作、科普、教育和文化建设等。

CONTENTS

目 录

Chapter One Frontiers in Supramolecular Chemistry, Nanotechnology and Industrial Mineralogy

第一章 超分子化学、纳米和非金属矿若干科技前沿和新兴产业

- New Quantum Molecular Spintronics Based on Single-Molecule Magnets
..... Masahiro Yamashita(3)
- Molecular Tweezers-New Tools with Fascinating Medical Applications
..... Thomas Schrader(5)
- Functional Supramolecular Systems *via* Subcomponent Self-Assembly
..... Jonathan R. Nitschke(7)
- Assembling F-Elements in Polymetallic Complex for the Transformation
of Small Unreactive Molecules Marinella Mazzanti(9)
- Multinary Clusters-from Molecular Aesthetics to Macroscopic Functionality
..... Stefanie Dehnen(12)
- Extreme Thermomechanical Properties through a Supramolecular
Materials Approach Cameron Kepert(14)
- Nanostructure of Intermediate Clay Species in the Red Earth
Sediments, South China Hanlie Hong(16)

Chapter Two Supramolecular Chemistry, Materials & Applications

第二章 超分子化学、超分子结构材料和应用

- Cyclopeptides and Cyclopseudopeptides as Scaffolds for the Recognition
and Detection of Inorganic Anions in Water Stefan Kubik(21)
- Supramolecular Recognition and Smart Screening of Polymorphs
..... Valery Gorbachuk Mukhammet Gabdulkaev,
Karina Gataullina, Askar Gatiatulin, Marat Ziganshin(23)
- New Macrocycles and Their Supramolecular Applications
..... Paolo Della Sala, Carmen Talotta, Rocco Del Regno,
Annunziata Soriente, Margherita De Rosa, Placido Neri, Carmine Gaeta(25)

New Horizons of Azacrown Macrocyclic Complexes Bearing Pyridine Side Arms; from Catalytic to Supramolecular Applications	..... B. Ghanbari, L. Shahhosseini, M. Mahdavian, L. Asadi Mofarrah(27)
Environmental and Biological Sensing with Cavitands	..... Enrico Dalcanale(29)
Investigation on the Influence of Alkalinity in the Synthesis of Metal Organic Framework and the Application in Adsorption	..... Shella Permatasari Santoso, Artik Elisa Angkawijaya, Felycia Edi Soetaredjo, Maria Yuliana, Suryadi Ismadji(31)
Inherently Chiral Calixarenes; Synthesis and Applications	..... Gareth E Arnott(33)
Molecular Electronic Materials Based on Supramolecular Cation Structures	..... Takayoshi Nakamura(35)
On the Structural Diversity of Uranyl(VI) Schiff Base Complexes; from Discrete Molecules to Helicates	..... Norman Kelly, Jens Mizera, Kerstin Gloe, Karsten Gloe(37)
Iodocyclization/Photocyclization Approach to Diverse Benzothienobenzothiophene (BTBT) Derivatives	..... Tsugio Kitamura(39)
Metallosupramolecular Chemistry of Pillar[5]arene Derivatives	..... Shim Sung Lee(41)
About the use of Metal-Organic Frameworks(MOF) for Water Treatment	..... Vincenzo Russo, Rosa Turco, Rosa Vitiello, Riccardo Tesser, Maria Rosaria Iesce, Ok-Sang Jung, Martino Di Serio(43)
Novel Ether Linked Anthracene-Conjugates for Recognition of Anions and Bio-imaging	..... Anup Pandith, Hong-Seok Kim(45)
3d-4f Heterometallic Coordination Polymers Based on Mixed Valence Copper Centers	..... Carlos Cruz, Verónica Paredes-García, Diego Venegas-Yazigi(47)
New Lanthanide dinuclear coordination Compounds[Ln ₂ (L ₂) ₂ (NO ₃) ₄ (MeOH) ₄](MeOH) L = La ^{III} , Ce ^{III} , Dy ^{III} . Synthesis and Structural Properties	..... Karina Seguin, Diego Venegas-Yazigi, Verónica Paredes-García(49)
DNA Binding and Antitumor Activity of Ketoacetylene and Pyrazole Derivatives of Calix[4]Arene	..... Artem Agarkov, Anton Muravev, Svetlana Solovieva, Susan Matthews, Igor Antipin(51)
Giant Coercivity and Magnetic Blocking IN Radical-Bridged Lanthanide Single-Molecule Magnets	..... Selvan Demir(53)

Chapter Three Nano Chemistry, Nano Catalysis & Energy Nanomaterials

第三章 纳米化学、催化技术和新能源材料

Subnanometer Gold Clusters with Unique Structures and Properties	..... Katsuaki Konishi(57)
Facile Photoinduced pH-Adjusting Synthesis of High Amount Ti-Containing	

Mesosilica Catalyst for Selective Oxidation of Cyclohexane	Mei Wu, Wenbing Jiang, Lingli Ni, Jinlong Jiang, Jing Chen(59)
Perovskite Quantum Dots Nanocomposites and Large Amount Production by Microfluidic System for Applications in Q-LCD and Q-LED	Rushi Liu(61)
Growing the Bio-Economy Throuu Catalysis:Advancements in the Production of Fuels and Chemicals from Biomass Valorisation	Jorge Norberto Beltramini(63)
Non-Noble Metal Catalysts Modified on Silicon Structures for Efficient Solar Water Reduction	Shufen Hu(65)
A Separator Based on Clay Minerals for Advanced Lithium-Sulfur Batteries	Yanfei Yang, Junping Zhang(67)
Nanostructured Silicon from Clay Minerals for Lithium-Ion Battery Anodes	Runliang Zhu, Qingze Chen(69)
Silicon Oxides:A Promising Family of High-Capacity Anode Materials for Li-Ion Batteries	Liang Zhou, Liqiang Mai(71)
Fabrication of Au/Laponite Composite Nanostructure as SERS Substrate	Hao Zhang, Jing Zhang, Chaopeng Fu, Shutao Wu, Chunhui Zhou(73)
Effects of Dopants on the Interactions Between CO ₂ and Kaolinite	Jialiang Hou, Liang Bian, Faqing Dong, Hongping Zhang(75)
Transition Metal Complexes of Various Types of Structure Based on N-(2-pyridylmethyl) Iminodiethanol	Kil Sik Min(77)
2D Layered Nanomaterials for Visible Light-Driven Solar Fuels Production	Eliana S. Da Silva, Nuno M. M. Moura, Hanane Boumeriame, Ana Coutinho, Luísa Andrade, Tânia Lopes, Adélio Mendes, Cláudia G. Silva, Manuel Prieto, M. Graca P. M. S. Neves, Joaquim L. Faria(79)

Chapter Four Nanotechnology in Biology, Soil & Environment

第四章 纳米技术与生物技术、土壤和环境

Protein Adsorption to Nanoparticles:Molecular Orientation,Exchange, and Conformational Adaptation Observed by Solution NMR Spectroscopy	Roberto Tira, Carlo Giorgio Barracchia, Francesca Munari, Mariapina D'Onofrio, Michael Assfalg (83)
Biomedical Applications of Gold Nanostars	Piersandro Pallavicini, Pietro Galinetto, Angelo Taglietti (85)
Functionalization of Halloysite Nanotubes as Multifunctional Carrier for Treatment of Breast Cancer	Mingxian Liu, Xiaohan Yang, Jun Zhang, Jingqi Zheng, Xiang Cao, Hongzhong Liu, Rongrong He (87)
Coordination Chemistry for Metal Ion Based Biological Sensors	Peter Comba (89)

- Layer-by-layer Self-assembled Method for Fabricating Flame Retardant and Reusable Paper
 Ying Pan, Dong Zhang, Hongting Zhao (91)
- Poly (2-Hydroxyethyl Methacrylate) (PHEMA) Hydrogels Doped with Silver
 Nanoparticles—Preparation, Characterisation, Antibacterial Efficacy
 and Biocompatibility Praveen, Shinko Suzuki, Matt Myers, Peta L. Clode,
 Traian V. Chirila, Christine F. Carson, Murray V. Baker (94)
- CO₂ Methanation Performance of Selective Loaded Attapulgite-based Composites Catalyst
 Jing Ouyang, Wei Gu, Lixing Liang, Huaming Yang (96)
- Porous Silica Materials as a Drug Delivery System for Low Bioavailability Molecules:
 Synthesis, Modification and Anti-inflammatory Analysis Kevin Soesanto, Daniel,
 Angela Viona Santoso, Alex Susanto, Shella Permatasari Santoso,
 Maria Yuliana, Wenny Irawaty, Felycia Edi Soetaredjo, Suryadi Ismadji,
 Lannie Hadisoewignyo, Sandy Budi Hartono (98)
- Two Novel Isolongifolanone based Fluorescent Probes for Visualization of
 Toxic BF₃ in Solution and in Gas Phase Zhonglong Wang, Shifa Wang (100)

Chapter Five Cleaner Functionalization of Industrial Minerals into Nanomaterials

第五章 非金属矿清洁增值加工技术和功能材料

- Products and Mechanism Study in Acid-palygorskite Reactions
 Yuanfeng Cai (105)
- Biomedical Applications of Halloysite with Narrow Particle Size Distribution
 Yi Zhang, Liangjie Fu, Huaming Yang (107)
- Selective Synthesis of Ethylenimine via Dehydration of Monoethanolamine
 over Acid Activated Montmorillonite-supported Catalysts Zhongwen Liu (110)
- Facile Construction of Polymer-grafted Halloysite Nanotubes by Using a
 Redox Initiating System Hailei Zhang, Yonggang Wu, Xinwu Ba (112)
- High-temperature Vibrational Spectra Between Mg (OH)₂ and Mg (OD)₂: Anharmonic
 Contribution to Thermodynamics and D/H Fractionation for Brucite
 Ye Yu, Xi Zhu (114)
- Superhydrophobic and Superamphiphobic Coatings Based on Clay Minerals
 Junping Zhang, Bucheng Li (116)
- Applications of Nano Fibrous Clay Minerals in Oil-based Drilling Fluids
 Guanzheng Zhuang, Zepeng Zhang (118)
- A Novel Study of Pore Structure, Fractal Character, Surface Properties and Humidity
 Control Performance of Diatomite with Calcination Processing
 Zhibo Hu, Shuilin Zheng, Hongjuan Sun, Yu Li, Xinqing Wen (121)
- Methods to Control Swelling of Clay in Coal Bed Methane Wells

- Thomas E. Rufford, Archana Patel, Lei Ge, Brian Towler, Victor Rudolph (123)
- A Facile One-step Coprecipitation Reduction Method for Fabrication of Sepiolite
Supported Cobalt-Cobalt Aluminum Composite Oxides Fei Wang, Peizhang Gao,
Jinsheng Liang, Tingting Zhang, Hui Zhang, Youpeng Ding, Tianze Xu (125)
- Preparation of Montmorillonite/Epoxy Resin Anticorrosive Membrane on Aluminum Plate
and its Properties Jingyi Liu, Shujie Liu, Shizhao Wu, Jing Gao, Guohua Li (128)
- A Novel Surface Modification Method Upon Halloysite Nanotubes: A Desirable
Cross-linking Agent to Construct Hydrogels
..... Yuangong Zhang, Hailei Zhang, Xinwu Ba (130)
- Sorpton and Soil Immobilization of Iodide and Iodate Using Hydrotalcite
..... Dong Zhang, Hongting Zhao (132)
- Effects of Brazing Technology on Hermeticity of Alumina Ceramic-metal Joint Used in
Nuclear Power Plants Zhiqin Zheng, Facheng Yi, Longyue Xie, Liang Bian (134)
- Modulating Oxygen Vacancies of Metal Oxide by Nanoclay Support
..... Qihang Zhao, Liangjie Fu, Denghui Jiang, Jing Ouyang,
Yuehua Hu, Huaming Yang, Yunfei Xi (136)

Chapter Six Application of Industrial Mineral-based Nanomaterials

第六章 非金属矿纳米化学、结构和应用

- Protein Expression in *E. coli*: a System for Investigating the Antimicrobial Effect of
Silver Nanoparticles Nafeesa Khatoun, Chunhui Zhou, Meryam Sardar (141)
- Organic Acid-induced Lossless Leaching of Palygorskite Nanorods
..... Yushen Lu, Wenbo Wang, Qin Wang, Jiang Xu, Aiqin Wang (143)
- Intelligent Hybrid Pigments Composed of Montmorillonite and Natural Anthocyanin
Extracted from *Lycium Ruthenicum*
..... Shue Li, Bin Mu, Wenbo Wang, Qin Wang, Aiqin Wang (145)
- Synthesis of Nanostructured Mo-based with Oxygen Vacancies as Anode Electrode
Materials for Lithium-ion Batteries Caihong Yang, Zhuangzhi Sun,
Xiangli Xie, Qiankun Xiang, Xuemei Li, Hai Wang, Linjiang Wang (147)
- Preparation of Fewer-layer Graphene by Secondary Expansion Peeling of Graphite
..... Bo Hou, Hongjuan Sun, Tongjiang Peng (149)
- Cu/Montmorillonite-Catalyzed Oxidation of Glycerol to Acrylic Acid in a
Microfluidic Reactor Chaopeng Fu, Hao Zhang, Shutao Wu, Chunhui Zhou (152)
- Effects of Rare Earth Elements' Physicochemical Properties on Their Stabilization During the
Fe (II) aq-induced Phase Transformation of Ferrihydrite
..... Jian Hua, Chengshuai Liu, Fangbai Li, Zhenke Zhu,
Zhiqi Wei, Manjia Chen, Ting Gao, Guohong Qiu (154)

- Discovery of Natural Siderite Catalytic Hydrogen Peroxide: A Wide pH Range
 Fuwei Sun, Tianhu Chen, Haibo Liu, Dong Chen (156)
- Effect of Attapulgite on Hydration and Mechanical Properties of Portland Cement Paste
 Wenqiang Wang, Zuhua Zhang, Ping Duan (159)
- Phase Change Kinetics of Hexahydrate Calcium Chloride /Expanded Vermiculite
 Composites Phase Change Materials
 Shaogang Zhang, Jinhong Li, Xiaolong Ma, Zhiwei Yang (161)
- Creating Capsules with Cubanes
 Sotaro Kusumoto, Yang Kim, Masaaki Nakamura, Shinya Hayami (164)
- Small Angle X-ray Scattering Text on the Fractal Dimension of Hami Coal
 Sample with Gas Adsorbed under Different Pressure
 Baisheng Nie, Kedi Wang, Pengcheng Liu, Ze Ge (166)
- Nonionic Amidemolecules-modified Montmorillonite
 Cunjun Li, Chunhui Zhou (169)

**Chapter Seven Fusion of Supramolecular Chemistry,
 Nanotechnology and Industrial Mineralogy**

第七章 超分子化学、纳米材料与非金属矿的交叉融合

- Effective Removal of Methylene Blue by a Novel Two-Dimensional Mxene/Magnetic
 Iron Oxide Nanocomposite with Mechanism Study
 Ping Zhang, Xianzhe Zeng, Mingxue Xiang, Yun Huang (175)
- Synthesis of Organic Three-Dimensional MgAl Layered Double Hydroxide for Ionic
 Dyes Effective Removal with Mechanism Investigation
 Ping Zhang, Sida Ouyang, Tao He, Ruonan Ma, Yun Huang (178)
- Efficient Singlet Oxygen Generation and Photophysical Properties of Pet-Based
 Environment-Sensitive Bodipys
 Mingyu Liu, Mingxu Jia, Linlin Liu, Xiaofang Hu, Wenbin Hu (181)
- Rares Earth Elements Doped Halloysite/BiVO₄ Hybrid Pigments
 Xiaowen Wang, Bin Mu, Jiang Xu, Aiqin Wang (183)
- Preparation and Photocatalyst of N-Doped TiO₂/Muscovite composites
 Yao Li, Hongjuan Sun, Tongjiang Peng (185)
- Photocatalytic Antibacterial Properties of Dopd-TiO₂/Musovite Composites
 Hao You, Hongjuan Sun, Tongjiang Peng (187)
- Molecule Separation Through Highly Stable Clay-Based Membranes
 Hongfei Cheng, Yi Zhou (189)
- Comparison of Interfacial Behavior with Calix [4] Arene Derivatives at Heterogeneous
 Liquid-Liquid Interfaces
 Jeong Hwan Cho, Gang San Hong, Ki Hoon Shin, Young Kim (192)