学术简报丨近期学校科研成果展示（20211202）

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编 者 按

经学校申报、专家组考察评估、市领导研究，我校被定位为北京市重点建设的**高水平研究型大学**，学校的教育事业发展进入了新阶段。学校将以此为契机，以高水平科研平台建设、科研项目申报、科研成果获批为导向，提升科研创新能力，推动科技成果转化，为实现具有商科、轻工和食品特色的世界一流大学不懈努力，力争为国家和首都经济社会发展做出新的更大贡献。

为激发全校师生的科研热情，展示学校各类高水平科研成果，科学技术处、党委宣传部推出**《学术简报》**栏目，在栏目中推送各学科的最新科研成果，以便师生全面、准确了解各学科科研发展状况，促进各学科间相互交流与合作，推动学校整体科研工作水平的整体、稳步提升。

数学与统计学院曹显兵教授、莫立坡教授团队于顶级学术期刊发表学术论文

Distributed Continuous-Time Optimization of Second-Order Multiagent Systems With Nonconvex Input Constraints

Lipo Mo, Yongguang Yu, Lin Zhao, and Xianbing Cao

***Abstract*—This article discusses the distributed continuous-time optimization problem (DCTOP) of second-order multiagent systems (SOMASs). It is assumed that the inputs are required to be in some nonconvex sets, the team objective function (TOF) is a combination of general differentiable convex functions, and each agent can only obtain the information of one local objective function. Based on the neighbors' information, a new distributed continuous-time optimization algorithm (DCTOA) is first proposed for each agent, where its gradient gains are nonuniform. By introducing a scaling factor and a model transformation, the corresponding system is changed into a time-varying nonlinear system which does not contain constraint operator in form. Then, it is proven that all agents' states could reach an agreement and the TOF could be minimized by constructing some new Lyapunov functions. Finally, the effectiveness of the algorithm is shown by simulation results.**

***Index Terms*—Agreement, continuous-time algorithm, distributed optimization, nonconvex constraints, nonuniform gains, second-order systems.**

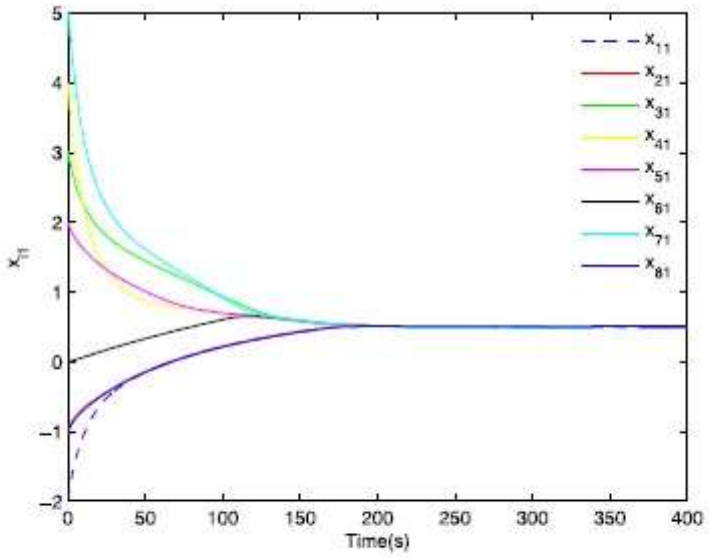


Fig. 2. First components of all agents' positions.

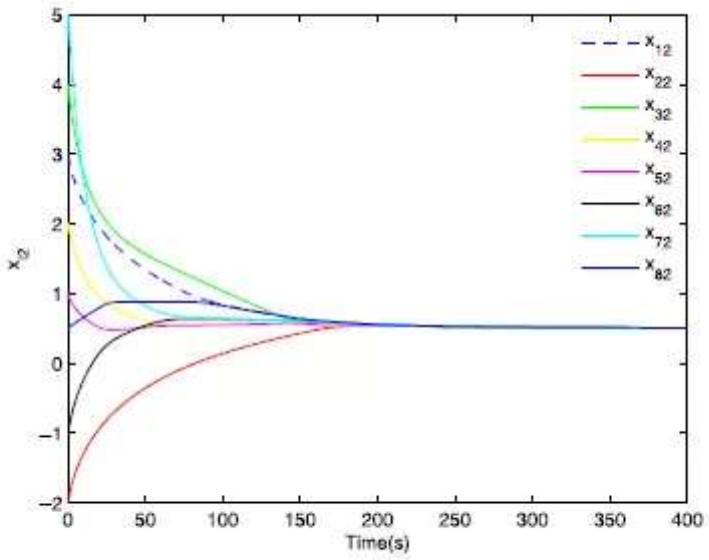


Fig. 3. Second components of all agents' positions.

该论文主要针对输入受非凸约束的多智能体系统，设计了一个非光滑连续时间分布式优化算法，证明了所有智能体最终可以实现一致，同时找到全局目标函数的最优点。最后，文章给出了该算法在分布式线性回归中的应用实例。该期刊由美国电气与电子工程师学会（Institute of Electrical and Electronics Engineers，IEEE）主办，系国际自动化与控制系统领域中科院SCI一区期刊。

数学与统计学院涂建华教授发表高水平学术论文

AIMS Mathematics

http://www.aimspress.com/journal/Math

AIMS Mathematics, 7(1): 569–578.
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Research article

Polynomial time recognition of vertices contained in all (or no) maximum dissociation sets of a tree

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Abstract: In a graph G, a dissociation set is a subset of vertices which induces a subgraph with vertex degree at most 1. Finding a dissociation set of maximum cardinality in a graph is NP-hard even for bipartite graphs and is called the maximum dissociation set problem. The complexity of the maximum dissociation set problem in various sub-classes of graphs has been extensively studied in the literature. In this paper, we study the maximum dissociation problem from different perspectives and characterize the vertices belonging to all maximum dissociation sets, and no maximum dissociation set of a tree. We present a linear time recognition algorithm which can determine whether a given vertex in a tree is contained in all (or no) maximum dissociation sets of the tree. Thus for a tree with n vertices, we can find all vertices belonging to all (or no) maximum dissociation sets of the tree in $O(n^2)$ time.

Keywords: maximum dissociation set; tree; polynomial time algorithm; independent set
Mathematics Subject Classification: 05C05, 05C69, 05C85

该论文研究了最大分离集问题，分离集是经典的独立集的一种自然推广，在网络安全、社团结构划分、无线传感器网络等领域有着广泛应用。论文对树图的最大分离集做了细致结构刻画，并给出了一个线性时间算法，能判别树的给定顶点是否在所有的最大分离集、还是在部分分离集中、或者不再任何最大分离集中。

数学与统计学院孙琪发表高水平学术论文

Front. Math. China 2021, 16(2): 567–594
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RESEARCH ARTICLE

Lower deviations for supercritical branching processes with immigration

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分支过程的极限的是概率论中重要问题，孙琪在《Lower deviations for supercritical branching processes with immigration》一文中给出了Schroder和Bottcher两种特殊情况下的分支过程的边界。

食品与健康学院熊科教授和人工智能学院王小艺教授关于粮油食品真菌毒素危害预测模型研究

研究团队在《Journal of Stored Products Research》上发表了预测微生物模型相关的学术论文《Modelling the effect of environmental factors on the growth of Aspergillus parasiticus and mycotoxin production in paddy during storage》。

Journal of Stored Products Research 93 (2021) 101846

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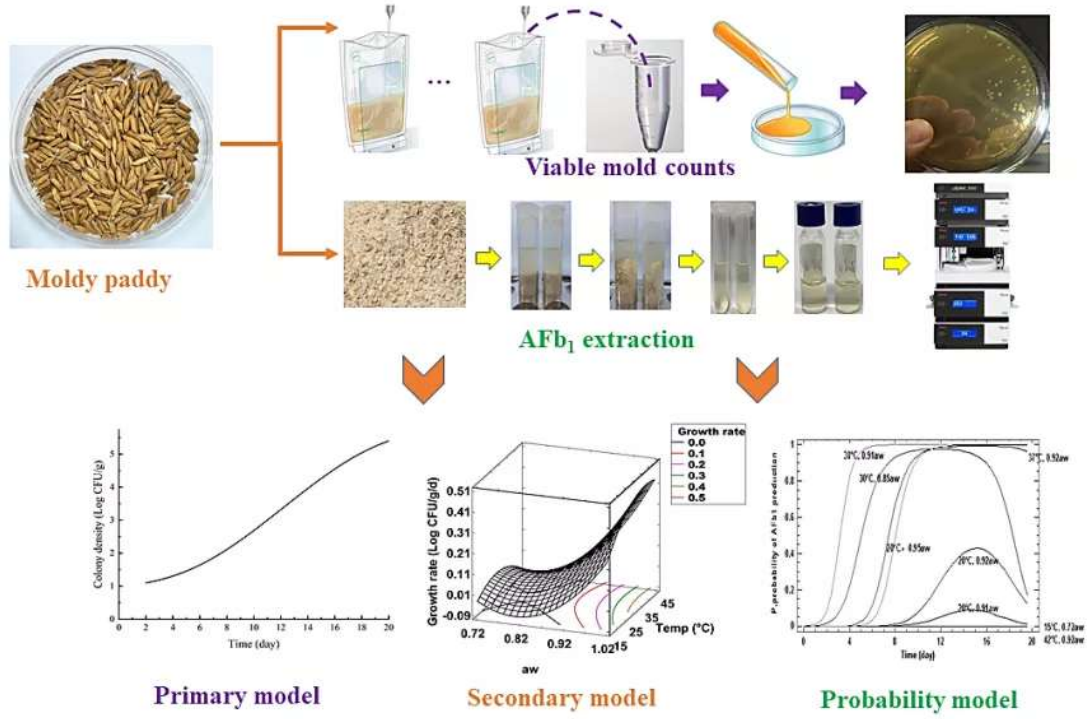
Journal of Stored Products Research

journal homepage: www.elsevier.com/locate/jspr

Modelling the effect of environmental factors on the growth of *Aspergillus parasiticus* and mycotoxin production in paddy during storage☆

Penggang Pei [a,b], Ke Xiong [a,c,**], Xiaoyi Wang [a,d,*], Baoguo Sun [a,b], Zhiyao Zhao [a,d], Jiping Xu [a,d], Xuebo Jin [c,d], Hong Ye [b,c], Junsong Xiao [b,c], Jianlei Kong [c,d]

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研究模拟稻米在贮藏20 d的过程中，易感染的寄生曲霉真菌的生长及产毒的情况。研究收集霉菌生长和毒素产生数据，建立霉菌生长动力学模型和概率模型。采用Baranyi和Gompertz模型作为一级模型，估计了滞后阶段和最大比生长率。采用多项式模型、Davey模型和Gibson模型等二级模型，评估不同温度（T）和水分活度（aw）条件对寄生曲霉生长速率的影响。研究发现与Gibson和Davey模型相比，多项式模型的评估更好，并得出了霉菌生长的实际T和aw。研究发现Logistic模型在预测生长边界和寄生曲霉所产黄曲霉毒素B1（AFB1）概率上显示出良好的结果。所采用的模型预测结果良好，表明该模型是描述和预测模具在不同T和aw下寄生曲霉生长的有效工具。研究结果可为防治稻谷贮藏过程中真菌腐败

和毒素的产生提供理论依据。研究通过对稻米供应链毒素危害物进行模型预测，为进行粮油食品供应链提前预警和溯源，实现供应链的“源头防控”奠定理论基础。

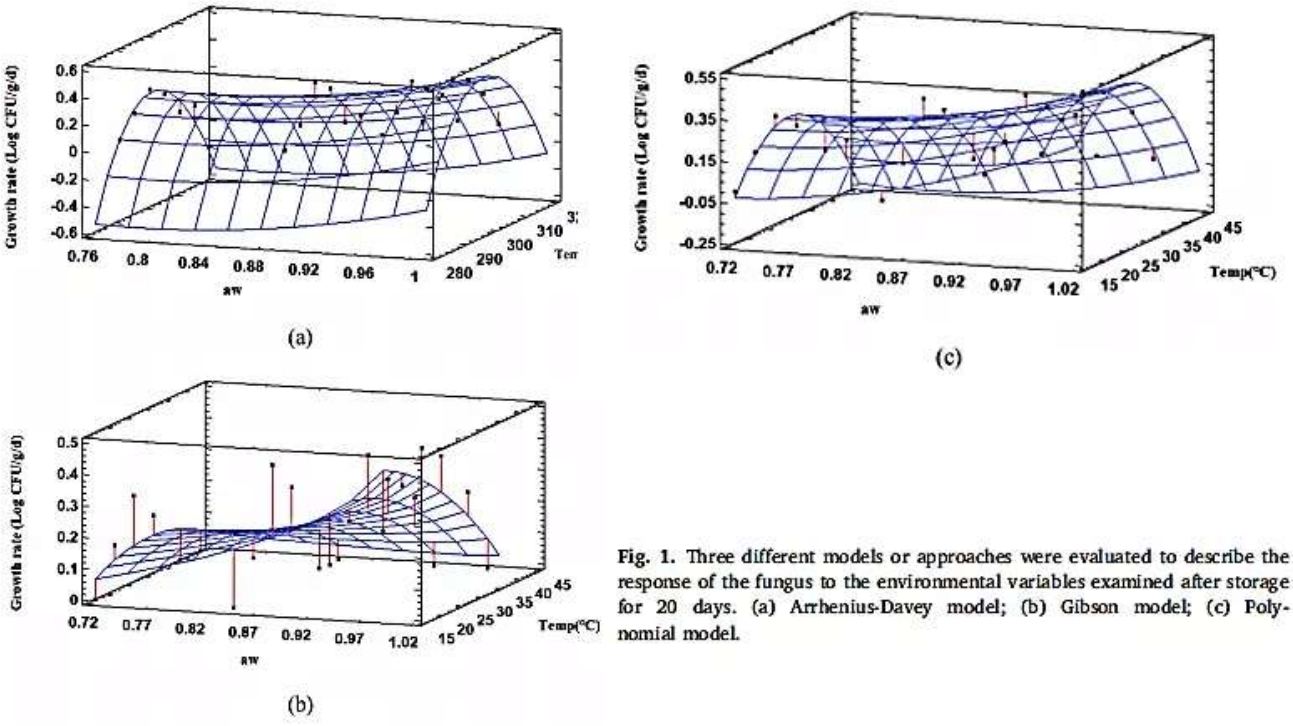


Fig. 1. Three different models or approaches were evaluated to describe the response of the fungus to the environmental variables examined after storage for 20 days. (a) Arrhenius-Davey model; (b) Gibson model; (c) Polynomial model.

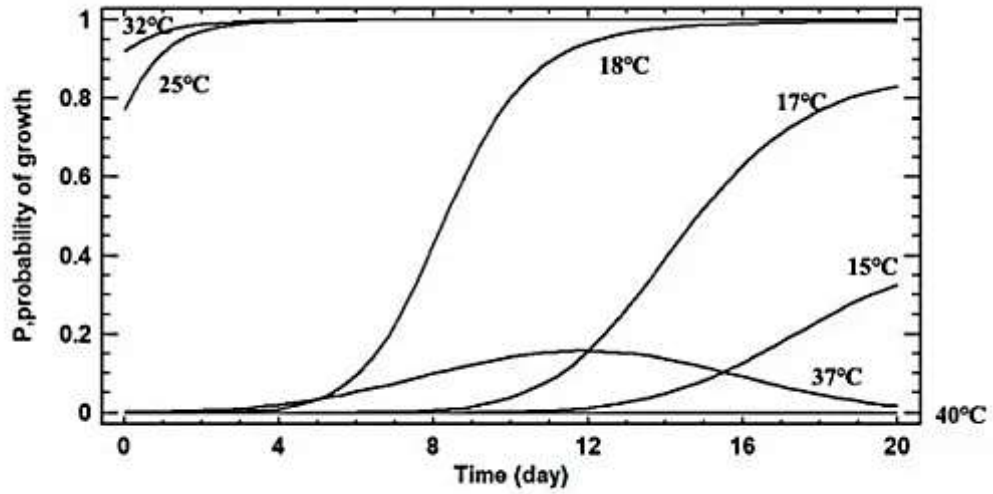


Fig. 4. Plots the probability of growth/no growth with time under 20%mc.

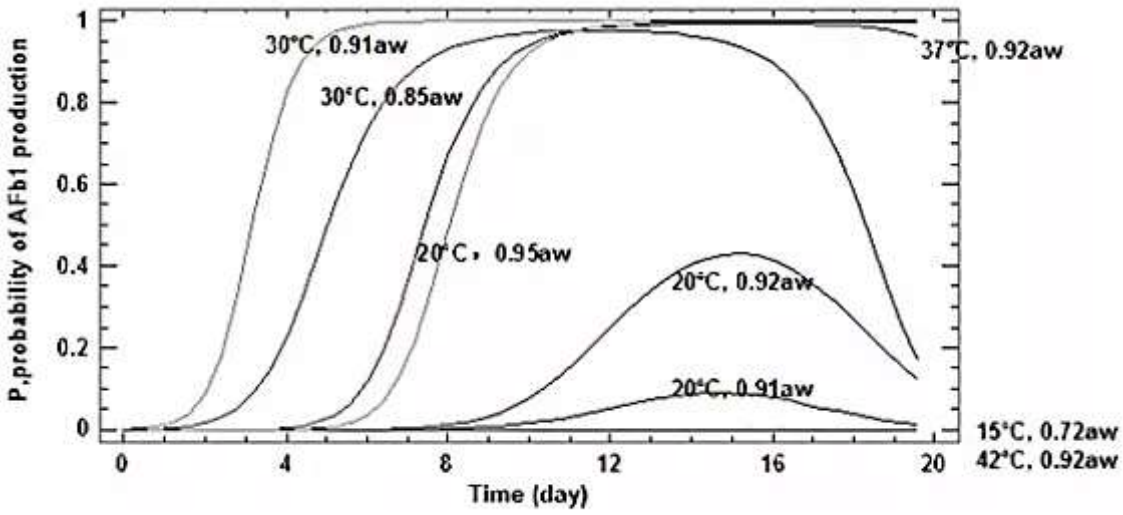


Fig. 5. Plots for the probability of AFB1 production.

本研究由国家重点研发计划项目(No. 2017YFC1600605)资助。

原文链接：

Penggang Pei,Ke Xiong*, Xiaoyi Wang,* Baoguo Sun, Zhiyao Zhao, Jiping Xu, Xuebo Jin, Hong Ye, Junsong Xiao, Jianlei Kong. Modelling the effect of environmental factors on the growth of Aspergillus parasiticus and mycotoxin production in paddy during storage[J]. Journal of Stored Products Research,93, 2021:e101846.

https://doi.org/10.1016/j.jspr.2021.101846

轻工科学技术学院关于北工商海洋杆菌的研究开发解决我国黄酒生产的两大难题

黄酒是我国特有的发酵酒，具有悠久的历史。然而，黄酒生产和消费远逊于白酒、红酒和啤酒。究其原因，除了黄酒独特的风味品质具有一定的局限外，黄酒生产也存在许多问题，比如：黄酒中生物胺含量较高，较高的生物胺含量对人体有害，严重影响了黄酒的品质与安全；此外，大部分黄酒为了改善色泽需要添加化工产品焦糖色，消费者异常排斥。因此，如何降低生物胺含量和免加焦糖色已经成为困扰黄酒产业的两大难题。

北工商海洋杆菌（Pontibacter beigongshangensis），是由我校轻工科学技术学院任清副教授团队从黄酒曲中分离出来的新菌种，这是我国从黄酒中发现的唯一新菌种，也是我国第一个用高校名字命名的微生物。北工商海洋杆菌具有两大特殊的生物学功能，第一，该菌可以合成番茄红素和胡萝卜素，提高黄酒的营养、色泽和感官品质，免加焦糖色；第二，该菌可诱导片球菌产生细菌素，抑制发酵醪中的杂菌，有效降低黄酒中的生物胺含量。

任清副教授团队应用该菌制备原生强化功能曲， 利用原生强化功能曲酿造黄酒，生物胺含量降低20-30%，酒体颜色金黄清亮透明，免加焦糖色。彻底解决了黄酒生产中生物胺含量过高和需要添加焦糖色的两大难题。



我校与国内最大的几家黄酒企业会稽山、古越龙山、塔牌和北京忠和酒业有限公司合作，企业利用该技术生产的黄酒已经上市，提高了黄酒品质，三年累计新增销售额2.66亿元，新增利润7414万元。6月28日，由轻工业联合会组织专家鉴定，一致认为该技术解决了黄酒生产中的难题，创新性强，达到了国际领先水平。该技术和相关研究是我国发酵酿酒产业的重大技术突破，进一步巩固和加强了我校在发酵酿酒学科的学术地位。

轻工科学技术学院陈海涛教授团队在《Food Chemistry》发表关于GC-IMS在食品风味领域中应用的综述文章入选ESI热点论文

挥发性成分的快速、无损、高通量测试和筛选在食品风味分析中起着重要作用。气相色谱-离子迁移谱（GC-IMS）是一种用于分离和灵敏检测挥发性有机化合物的强大技术。它具有响应快、灵敏度高、操作方便、成本低等特点。本文简要介绍了GC-IMS的工作原理，同时综述了其在不同食品风味分析领域中应用的最新研究，其中包括食品分类和掺假、食品新鲜度和腐败的评价、异味检测、食品加工监控以及食品储存过程中香气变化的评价。在文章的最后，也提出了GC-IMS的未来发展方向。

经检索基本科学指标数据库（Essential Science Indicators，简称ESI），该论文入选2021年11月版ESI热点论文。

论文信息：

Shuqi Wang, Haitao Chen, Baoguo Sun. Recent progress in food flavor analysis using gas chromatography–ion mobility spectrometry (GC–IMS). Food Chemistry,
2020,315: 126158.
https://doi.org/10.1016/j.foodchem.2019.126158



Food Chemistry 315 (2020) 126158

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Food Chemistry

journal homepage: www.elsevier.com/locate/foodchem

Recent progress in food flavor analysis using gas chromatography–ion mobility spectrometry (GC–IMS)

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ARTICLE INFO

Keywords:
GC-IMS
Food flavor
Volatile organic compounds
Adulteration

ABSTRACT

Rapid, nondestructive, high-throughput testing and screening of volatile ingredients plays an important role in food flavor analysis. Gas chromatography–ion mobility spectrometry (GC-IMS) is a powerful technique for the separation and sensitive detection of volatile organic compounds. It has a fast response, high sensitivity, easy operation, and low cost. In this article, a brief introduction to the working principle of GC-IMS is presented. A summary of recent studies of different food flavor analysis applications is also provided, including food classification and adulteration, the evaluation of food freshness and spoilage, off-flavor detection, monitoring the processing of food products, and evaluation of aroma changes during food storage. Finally, future directions of GC-IMS are proposed.

1 Recent progress in food flavor analysis using gas chromatography-ion mobility spectrometry (GC-IMS)

Wang, SQ; Chen, HT and Sun, BG

Jun 15 2020 | FOOD CHEMISTRY 315

Rapid, nondestructive, high-throughput testing and screening of volatile ingredients plays an important role in food flavor analysis. Gas chromatography-ion mobility spectrometry (GC-IMS) is a powerful technique for the separation and sensitive detection of volatile organic compounds. It has a fast response, high sensitivity, easy operation, and lo... 显示更多

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61 被引频次

67 参考文献

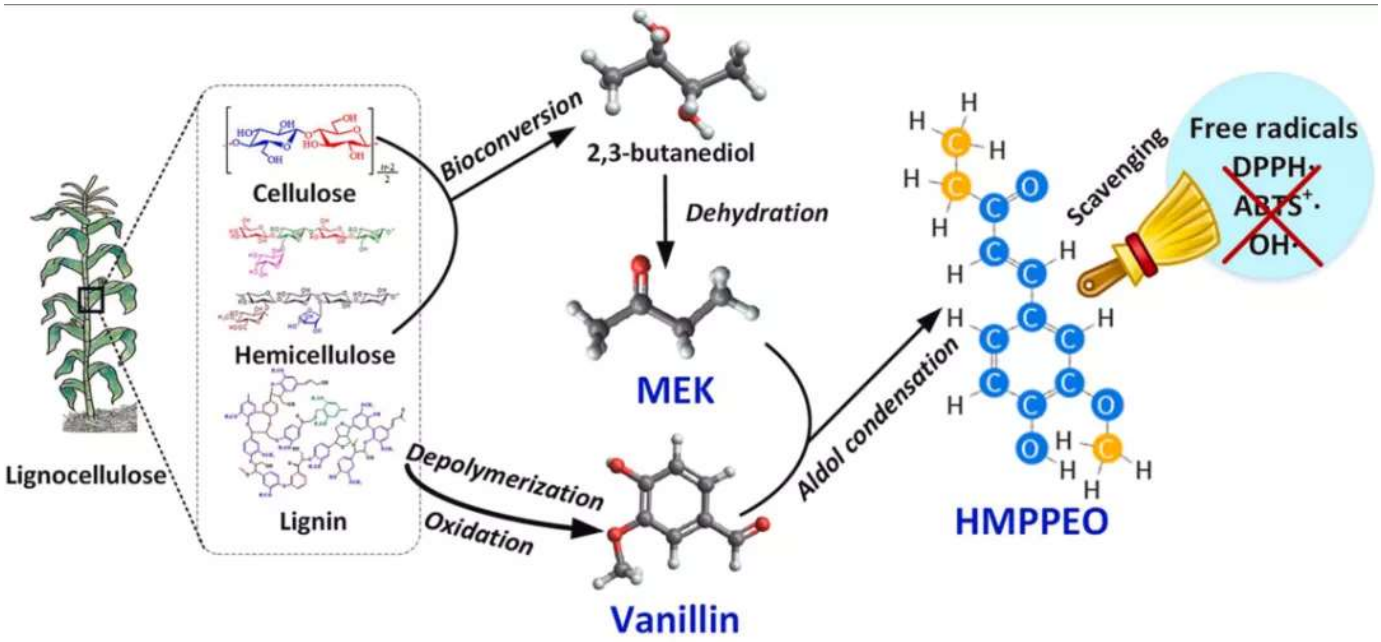
相关记录

轻工科学技术学院白宇辰在Journal of Cleaner Production发表高水平学术论文

今年3月我国人大通过了《第十四个五年规划和2035年远景目标纲要》提出2030年碳达峰和2060年碳中和的“双碳目标”。消除二氧化碳等温室气体排放所引发的气候变化威胁，需进一步调整能源结构，通过科技创新实现用可再生能源替代化石能源。其中生物质是唯一的可持续有机碳源，对生物质的综合开发与利用，对于实现双碳目标至关重要。

本论文提出全生物质来源转化生产受阻酚类抗氧化剂的新合成途径，开发了新型的脂溶性高效抗氧化剂，可在食品、化妆品、药物中间体、燃油添加剂等多个领域广泛应用。与现有受

阻酚类抗氧化剂相比，产物具有优良的抗氧化性与自由基清除能力，同时具有良好的络氨酸酶抑制效果与低毒性，可利用全生物质资源转化生产，因此是具备开发利用价值和规模化生产潜力的新型绿色抗氧化剂。



本论文《Synthesis, characterization and application of a new biomass-based antioxidant derived from vanillin and methyl ethyl ketone》是轻工科学技术学院白宇辰老师与清华大学赵雪冰副教授团队合作发表在Journal of Cleaner Production杂志（北京工商大学为第一单位）。Journal of Cleaner Production为环境工程大类1区Top期刊，JCR2021年影响因子9.297。

该研究工作受到国家自然科学基金(No. 21878176)资助。

论文信息：

Bai, Y., Jian, J., Liu, D., & Zhao, X.* (2021). Synthesis, characterization and application of a new biomass-based antioxidant derived from vanillin and methyl ethyl ketone. Journal of Cleaner Production, 316, 128315. https://doi.org/10.1016/j.jclepro.2021.128315

Journal of Cleaner Production 316 (2021) 128315

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Journal of Cleaner Production

journal homepage: www.elsevier.com/locate/jclepro

Synthesis, characterization and application of a new biomass-based antioxidant derived from vanillin and methyl ethyl ketone

Yuchen Bai [a,b,c], Jinghai Jian [d], Dehua Liu [b,c,d], Xuebing Zhao [b,c,d,*]

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ARTICLE INFO

Handling Editor: Panos Seferlis

Keywords:
Methyl ethyl ketone
Vanillin
Aldol condensation
1-(4-Hydroxy-3-methoxyphenyl) pent-1-en-3-one
Antioxidant

ABSTRACT

A bio-based antioxidant with a similar chemical structure to ferulic acid (FA) was synthesized by Aldol condensation of biomass-derived vanillin and methyl ethyl ketone (MEK). The synthesized product, 1-(4-hydroxy-3-methoxyphenyl) pent-1-en-3-one (HMPPEO) was purified and characterized by FTIR, MS, ^{1}H-NMR and ^{13}C-NMR, providing the data that have not been previously reported. Kinetic modelling revealed that the major reactions taking place in the systems were the Aldol condensation between vanillin and MEK to form HMPPEO and self-condensation of HMPPEO to form heavier product with observed activation energy of 51.7 kJ/mol and 48.3 kJ/mol, respectively. Compared with FA, HMPPEO had similar ability to scavenge HO· and DPPH· free radicals but stronger ability to inhibit tyrosinase activity. Oxidation stability of palm oil biodiesel could be greatly improved to meet the corresponding standard with addition of 1000 mg/kg HMPPEO. This work demonstrates that biomass-derived HMPPEO shows promising application as a green antioxidant or intermediate for industrial or pharmaceutical purpose.

化学与材料工程学院张彩丽副教授发表高水平学术论文

张彩丽副教授在国际知名期刊《Polymer》上发表了关于高阻隔生物基呋喃聚酯膜的气体渗透性研究的学术论文《Gas barrier properties of furan-based polyester films analyzed experimentally and by molecular simulations》，文中采用分子模拟和实验结合的方法分析了氧气和二氧化碳气体在三种不同结构的呋喃基聚酯薄膜中的传输特性。分子模拟研究了含不同亚甲基量的呋喃基聚酯对薄膜输气性能及其它性能的影响。用大正则蒙特卡罗方法测定了膜的气体吸附容量和活性位点。用分子动力学方法分析了气体分子在薄膜中的扩散过程。这一工作为呋喃基聚酯薄膜的渗透性和形成机理提供了理论基础。特别是在呋喃基聚酯中，环旋转的非线性轴与杂环的双极性耦合显著地阻碍了呋喃环翻转，这一特性有利于呋喃基聚酯作为高阻隔型新型食品包装材料的应用。

Polymer 233 (2021) 124200

Contents lists available at ScienceDirect

Polymer

journal homepage: www.elsevier.com/locate/polymer

Gas barrier properties of furan-based polyester films analyzed experimentally and by molecular simulations

Min Zhao, Caili Zhang *, Fan Yang, Yunxuan Weng **

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ARTICLE INFO

Keywords:
Bio-based furan polyester
Barrier properties
Molecular simulations

ABSTRACT

"Green" alternatives for petroleum-derived engineering plastics, like poly(ethylene terephthalate) (PET), include polyesters synthesized from 2,5-furan-dicarboxylic acid (FDCA). FDCA-based polyesters attracted a lot of attention from scientists and engineers because of their excellent gas barrier properties. This work analyzed, theoretically and experimentally, the transport properties of oxygen and carbon dioxide in amorphous poly (ethylene 2,5-furandicarboxylate) (PEF), poly(propylene 2,5-furandicarboxylate) (PPF) and poly(butylene 2,5-furandicarboxylate) (PBF) films. Molecular simulations studied the effect of the furan-based polyesters containing different amounts of methylene on the films' gas transport performance and other properties. The adsorption capacity and active sites in the films were assessed using the Grand Canonical Monte Carlo (GCMC) method. The gas molecule diffusion through the films was analyzed by the molecular dynamics approach. The permeability of three polymers are extremely low. Specifically, PEF and PPF showed almost no difference in their gas permeability. However, as the methylene groups amount increased to 4 (in PBF), the oxygen permeability increased significantly while barely any changes in CO_2 were observed. We also prepared furan-based polyester films to experimentally assess their permeation performance, which agreed with the results obtained by simulations. This work provided some insights into the permeability and formation mechanisms of these films. In particular, the non-linear axis of ring rotation coupled with the dipolarity of the heterocycle in furan-base polyesters significantly hinders its furan ring-flipping. This feature is favorable in advancing furan-based polyesters as novel materials for food packaging applications.

化学与材料工程学院许柘宓副教授与意大利帕多瓦大学"伽利略•伽利雷"物理与天文学院Michele Merano教授团队、北京大学刘忠范院士团队合作在Nature子刊《Communications Physics》发表新型二维薄膜材料光学极化率张量探测的高水平论文

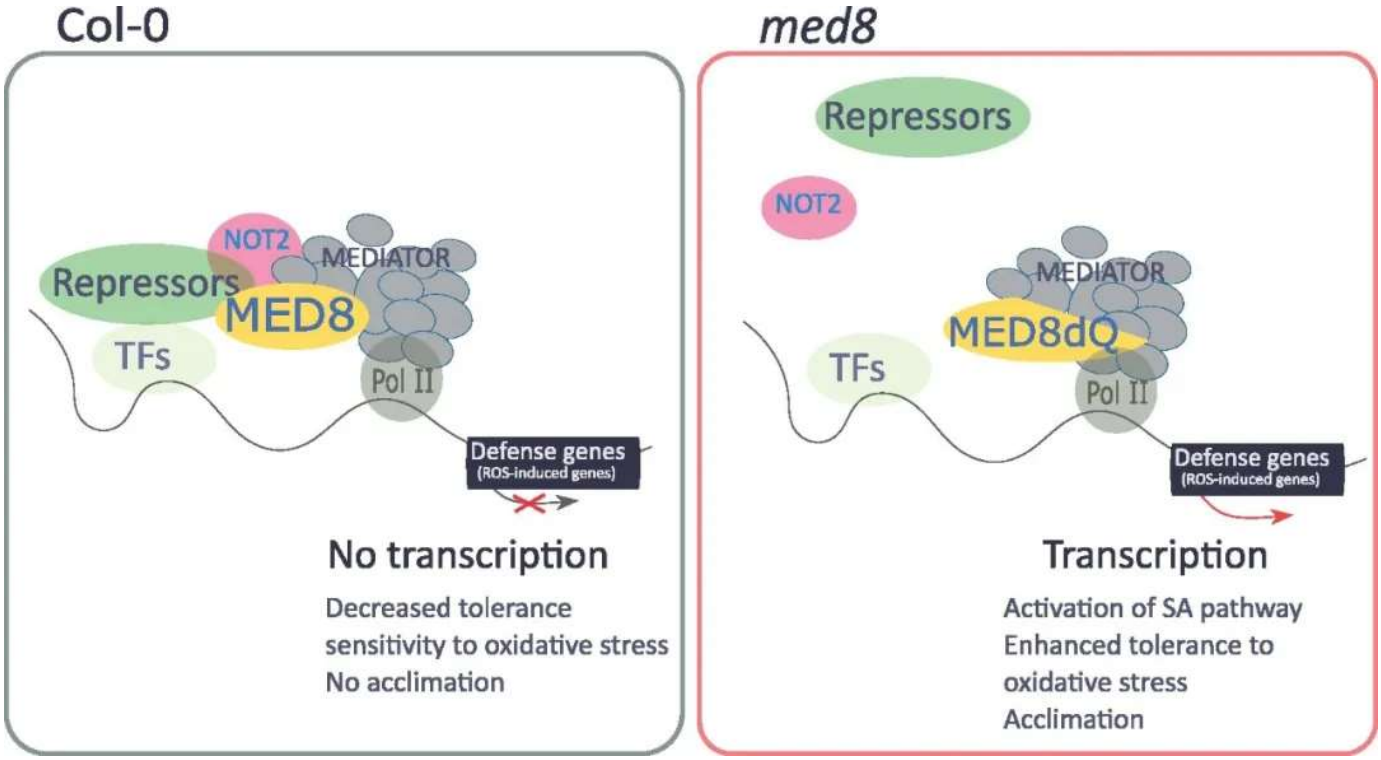
随着二维材料的发展，传统物理模型在很多方面已不能满足于二维材料特性的计算。例如传统的光折射计算需测量材料厚度，而新型二维材料的厚度往往仅有原子级别，因此沿用传统公式将会产生很大误差。单层二维材料法相面光学常数的测试因其精度要求高、难度大，一直以来仍是空白。本文通过理论推导和实验测试相结合的方式，成功突破了单层二维材料光学特性的测试，建立了新的二维材料光学模型，有效提升了光学极化率张力的计算与测试精度。该成果于2021年9月被Nature子刊《Communications Physics》杂志报道。

原文链接：DOI: 10.1038/s42005-021-00711-3

化学与材料工程学院何华名副教授在《The Plant Cell》发表论文《The Arabidopsis Mediator complex subunit 8 regulates oxidative stress responses》

过氧化氢(H2O2)可以作为信号分析通过协调全基因组转录重编程来调节植物的生长和防御。然而，控制H2O2依赖的基因表达的具体机制仍然知之甚少。中介体复合体（Mediator complex）是真核生物中一种进化上保守的转录辅助调节因子，参与各种转录步骤，包括启动、暂停、延伸和重新启动。到目前为止，中介体复合体亚基已被报道在器官和组织发育、激素信号、开花转换、免疫反应和非生物胁迫中发挥作用。本研究中，作者发现中介体复合体亚基MED8作为一个负调节因子，主要通过抑制SA途径发挥作用，参与H2O2介导的防御基因的表达激活。此外，通过互作蛋白质组分析揭示了中介体与参与mRNA加工和microRNA生物发生的组分之间的相互作用，从而将中介体的作用扩展到转录之外。值得注意的是，MED8与TATA-less的转录调控因子NOT2相互作用，控制H2O2诱导基因的表达和应激反应。

该成果于2021年6月发表于国际植物学领域顶级期刊《The Plant Cell》（2020年影响因子为11.277）。同期，The Plant Cell 杂志以IN BRIEF栏以Oxidative stress is H2O2 under the bridge without MED8 进行了亮点专评。



原文链接：

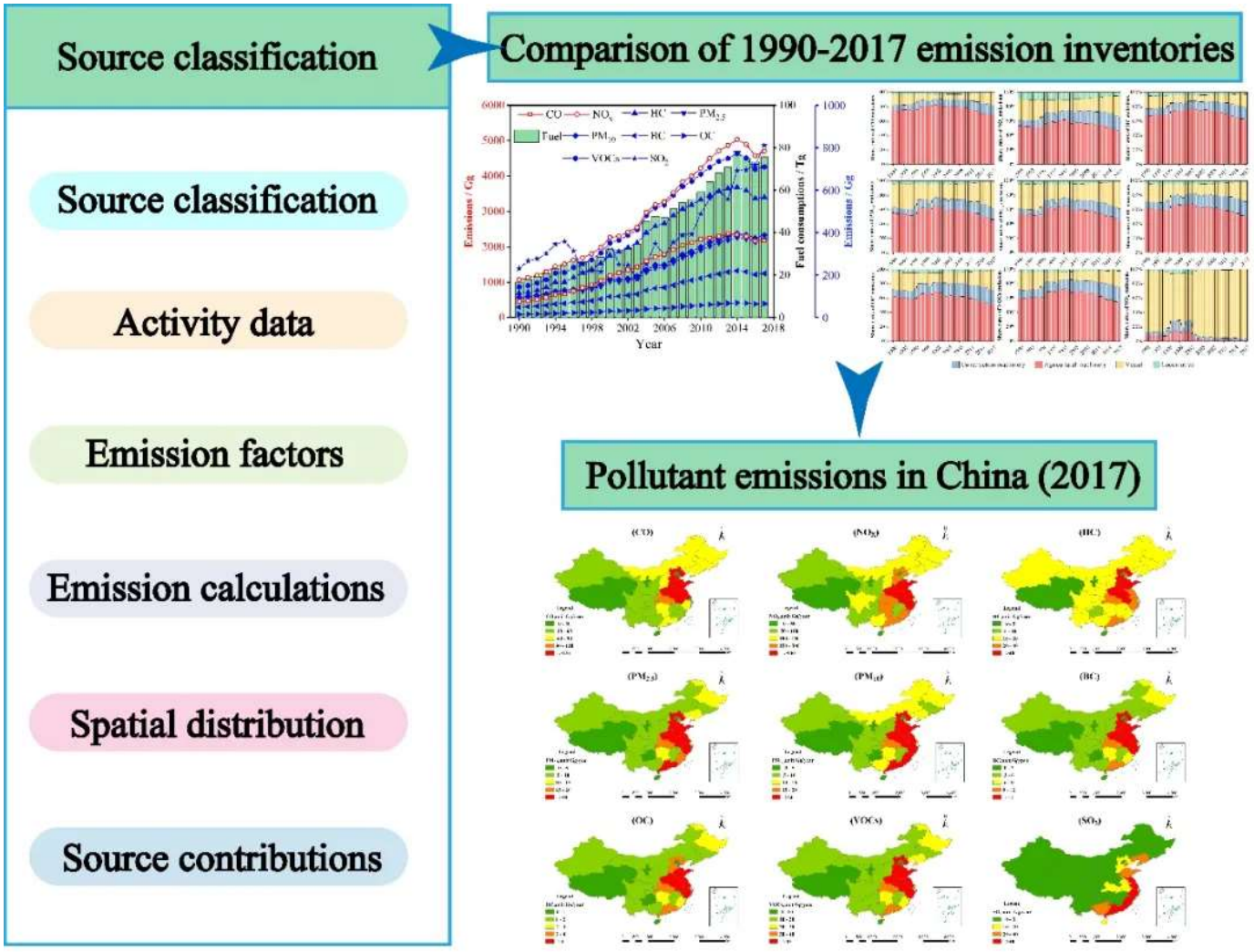
https://doi.org/10.1093/plcell/koab079

生态环境学院大气复合污染与控制团队在《Aerosol and Air Quality Research》（IF：3.063）发表中国非道路移动源排放清单的研究成果

近日城市大气复合污染与控制团队在《Aerosol and Air Quality Research》（IF：3.063）期刊上发表题为《Multi-type air pollutant emission inventory of non-road mobile sources in China for the period 1990–2017》的研究论文。

随着对道路移动源监管的日益严格，非道路移动源排放占移动源总排放的比例日益突出。因此，准确建立非道路移动源的排放清单对于确定旨在改善空气质量的政策至关重要。城市大气复合污染与控制团队建立了1990-2017年中国非道路移动源多污染物排放清单，研究结果涉及工程机械、农业机械、船舶和柴油机车四种非道路移动机械，CO、NOx、HC、PM2.5、PM10、BC、OC、VOCs和SO2九种污染物。研究结果表明：自1990年以来，中国非道路移动源污染物排放量持续增加，2014年以后缓慢下降，2017年再次上升。非道路移动源中船舶排放的SO2所占比例最大，而农业机械排放的其他污染物所占比例最大。2017年，农业机械排放的CO和NOx约为1472.5 Gg和2170.4 Gg，分别占非道路移动源CO和

NOx排放总量的67.7%和46.1%。污染物空间分布特征分析表明，高排放主要分布在华北平原和东南沿海地区。研究结果表明，有必要改进非道路设备活动的登记制度，我国迫切需要进一步研究非道路移动源的排放特性，以确保准确的排放因子。



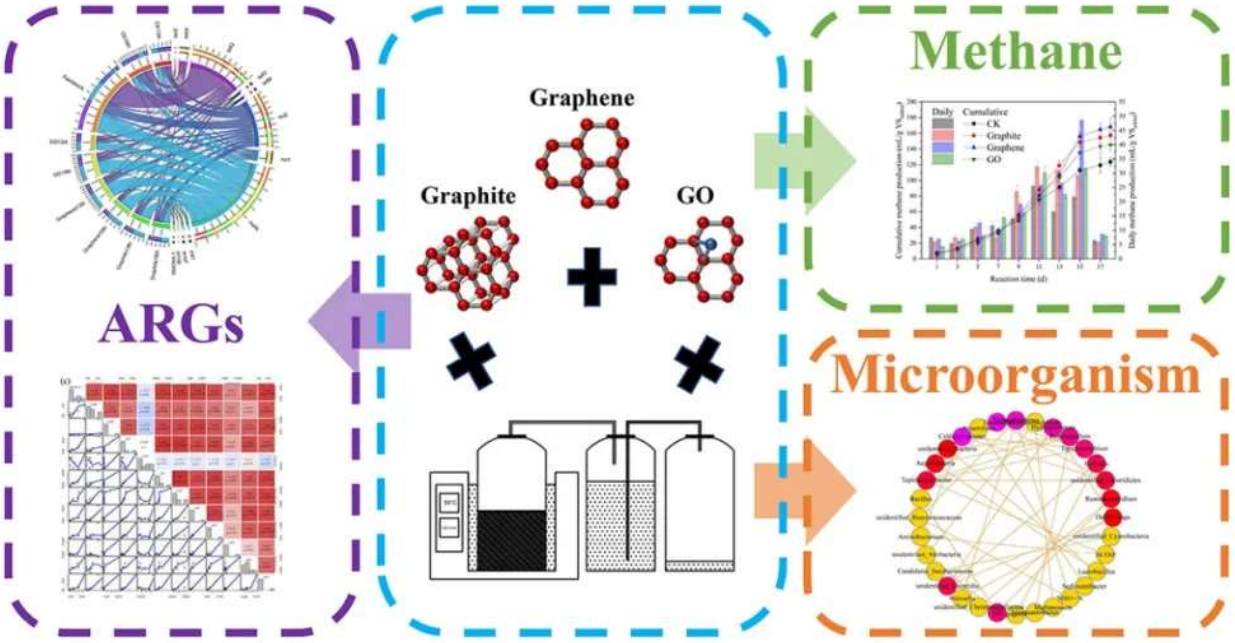
本文第一作者为生态环境学院申现宝副教授，通讯作者为生态环境学院姚志良教授；该研究工作受到北京市杰出青年基金(No. JQ19030）等项目资助。

原文信息：Shen, X., Kong, L., Shi, Y., Cao, X., Li, X., Wu, B., Zhang, H., Yao, Z. (2021). Multi-type Air Pollutant Emission Inventory of Non-road Mobile Sources in China for the Period 1990-2017. Aerosol Air Qual. Res. 21, 210003. https://doi.org/10.4209/aaqr.210003

生态环境学院固体废弃物处理与处置团队在《Bioresource Technology》发表石墨、石墨烯和石墨烯氧化物对污泥和食物垃圾共厌氧消化影响的研究成果

固体废弃物处理与处置团队在《Bioresource Technology》（IF：9.642）期刊上发表题为《Effects of graphite, graphene, and graphene oxide on the anaerobic co-digestion of sewage sludge and food waste: Attention to methane production and the fate of antibiotic resistance genes》的文章。

生物甲烷是通过厌氧消化技术产生的一种可替代石化燃料的清洁能源。固体废弃物处理与处置团队在探究厨余垃圾和污水污泥共同厌氧发酵产生甲烷的过程中，发现抗生素抗性基因（ARGs）在厌氧底物中丰度较高。本文探究了石墨、石墨烯和氧化石墨烯在厌氧消化过程中对甲烷产量和ARGs去除效率的影响。结果表明，石墨烯在提升产甲烷性能和有机物降解性能方面表现最佳，可以提高36.09%的甲烷产量和23.07%的固态有机质降解率，其次是石墨烯和氧化石墨烯。在厌氧消化过程中加入石墨烯和氧化石墨烯材料可以明显提升的ARGs去除效率，石墨烯材料对大环内酯类抗性基因（ermF和ermB）和部分四环素类抗性基因（tetQ和tetX）的去除效率提升明显；氧化石墨烯材料对磺胺类抗性基因（sul1和sul2）、部分四环素类抗性基因（tetM、tetO和tetW）和I类整合子（intI1）的去除效率提升明显。本研究为厌氧消化过程中提高生物甲烷产量和控制ARGs传播提供了理论基础。



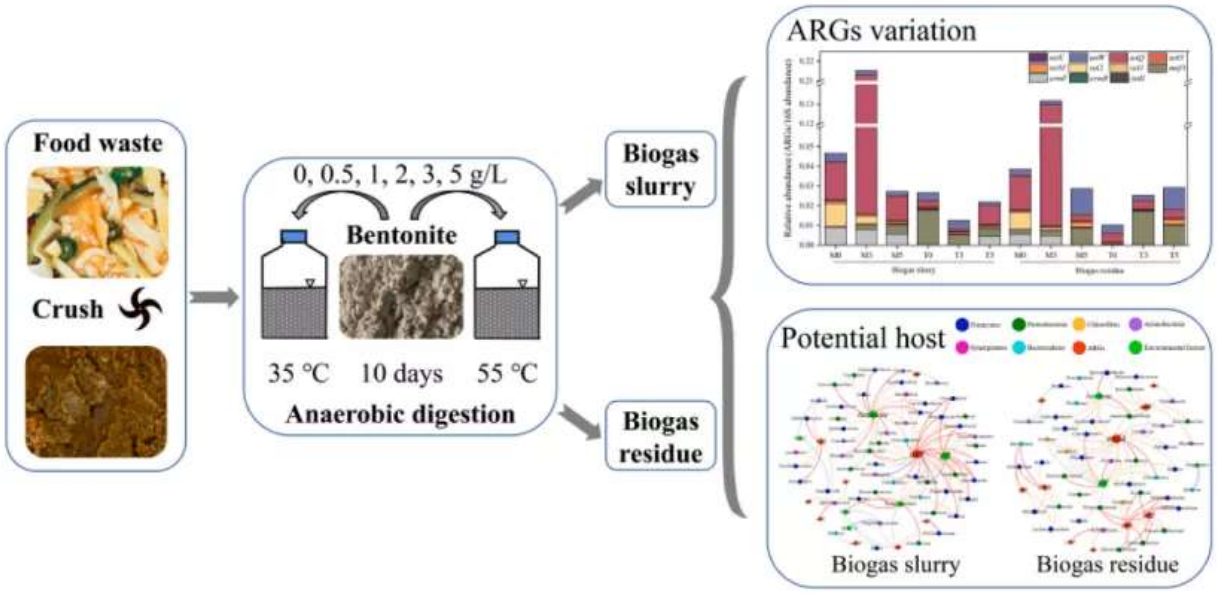
本文由生态环境学院王攀教授及研究生郑义共同第一作者，生态环境学院任连海教授担任通讯作者；该研究工作受到国家自然科学基金（42007350）、国家重点研发计划项目（2019YFC1906303）和北京市自然科学基金（8202010）资助。

原文信息：Wang, P., Zheng, Y., Lin, P., Li, J., Dong, H., Yu, H., Qi, L., Ren, L. 2021. Effects of graphite, graphene, and graphene oxide on the anaerobic co-digestion of sewage sludge and food waste: Attention to methane production and the fate of antibiotic resistance genes. Bioresource Technology, 339, 125585.

生态环境学院固体废弃物处理与处置团队在《Bioresource Technology》发表膨润土对餐厨垃圾厌氧发酵所产沼渣和沼液中抗生素抗性基因影响的研究成果

生态环境学院固体废弃物处理与处置团队在《Bioresource Technology》（IF：9.642）期刊上发表题为《Effects of bentonite on antibiotic resistance genes in biogas slurry and residue from thermophilic and mesophilic anaerobic digestion of food waste》的文章。

抗生素抗性基因在餐厨垃圾厌氧发酵过程中的增殖和传播将对生态环境和人类健康造成潜在威胁，本论文研究了廉价易得的膨润土对餐厨垃圾厌氧发酵性能及厌氧发酵所产沼渣和沼液中抗生素抗性基因的影响，结果表明，投加膨润土提高产气量的同时可以降低沼液、沼渣中抗生素抗性基因的丰度。统计学分析表明膨润土添加量和温度是影响抗生素抗性基因丰度和微生物群落结构的主要驱动因子。该研究为助力“碳中和”和餐厨垃圾厌氧发酵过程中抗性基因的控制提供了数据支撑和理论指导。



本文第一作者为生态环境学院王攀教授，通讯作者为生态环境学院任连海教授。本研究工作受到国家重点研发计划项目（2019YFC1906303）、国家自然科学基金（42007350）和北京市自然基金（8202010）等项目资助。

原文信息：Wang P, Wang X, Chen X, Ren, L. Effects of bentonite on antibiotic resistance genes in biogas slurry and residue from thermophilic and mesophilic anaerobic digestion of food waste[J]. Bioresource Technology, 2021, 336(2):125322. DOI: 10.1016/j.biortech.2021.125322

人工智能学院周珺副教授发表高水平学术论文

周珺副教授长期从事无机发光材料的“组成-结构-性能”关系研究，在新型发光材料的设计、单晶生长、结构解析以及发光性能调控方面积累了丰富的经验。目前共以第一作者和共同第一作者发表国际SCI论文21篇，包括Angew. Chem. Int. Ed（1篇）、J. Mater. Chem. A（2篇）、Mater. Chem. Front（2篇）、J. Mater. Chem. C（5篇）、J. Mater. Chem（1篇）、Adv. Optical. Mater（2篇）、J. Phys. Chem. Lett（1篇），Inorg. Chem（1篇）等，其中中科院一区论文14篇。2021年获批北京市自然科学基金一项。

周珺副教授近期在国际一流期刊《Materials Chemistry Frontiers》（IF=6.482）上发表学术论文两篇：《Alloying Cs+ into Rb2ZrCl6:Te4+ toward highly efficient and stable perovskite variants》和《Self-trapped exciton to dopant energy transfer into Sb3+-doped Cs2ZrCl6 perovskite variants》

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RESEARCH ARTICLE

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Cite this: *Mater. Chem. Front.*, 2021, 5, 4997

Alloying Cs^+ into $Rb_2ZrCl_6:Te^{4+}$ toward highly efficient and stable perovskite variants

Jun Zhou, †*[a] Ximing Rong, †[b] Maxim S. Molokeev,[cde] Yulong Wang,[a] Xiangyan Yun,[a] Denghui Xu *[a] and Xiong Li[a]

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rsc.li/frontiers-materials

Doping or alloying in perovskites and perovskite variants provides a promising way for modulating the electronic and photoluminescence properties and the structural stability. In this work, a series of yellow-emitting $Rb_{2-x}Cs_xZrCl_6:Te^{4+}$ solid solution phosphors were prepared by a hydrothermal method, and their broad emission is assigned to the triplet $^3P_1-^1S_0$ self-trapped excitons (STEs). Upon increasing the alloying ion Cs^+, the yellow emission can be greatly enhanced by a stronger Jahn–Teller distortion. Moreover, $Cs_2ZrCl_6:Te^{4+}$ shows a high photoluminescence quantum yield (PLQY), and impressive thermal and anti-water stability. This doping–alloying strategy presents a new direction towards designing lead-free, high-performance and stable perovskite derivatives.

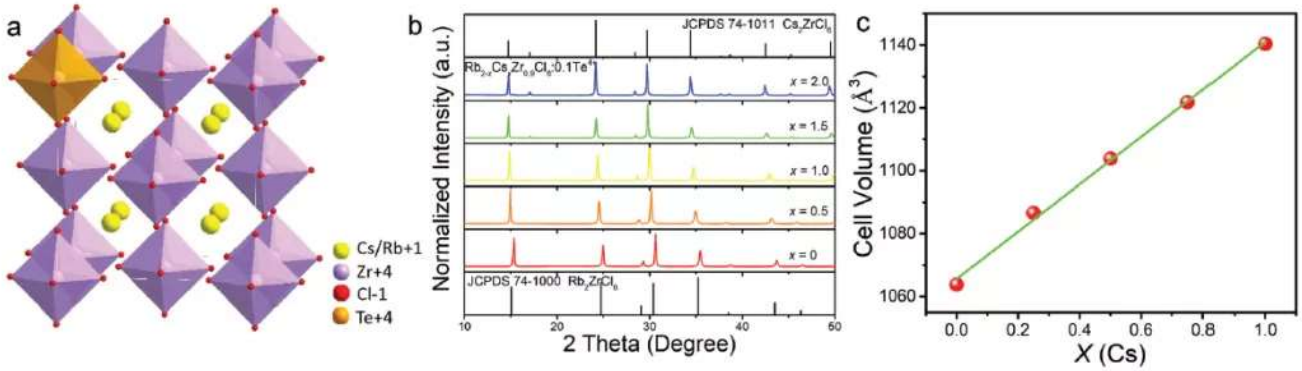


Fig. 1 (a) The crystal structure of $Rb_{2-x}Cs_xZrCl_6:Te^{4+}$. (b) XRD patterns of $Rb_{2-x}Cs_xZr_{0.9}Cl_6:0.1Te^{4+}$, along with JCPDS 74-1000 and JCPDS 74-1011 as a comparison. (c) The experimental cell volumes of $Rb_{2-x}Cs_xZr_{0.9}Cl_6:0.1Te^{4+}$ as a function of x.

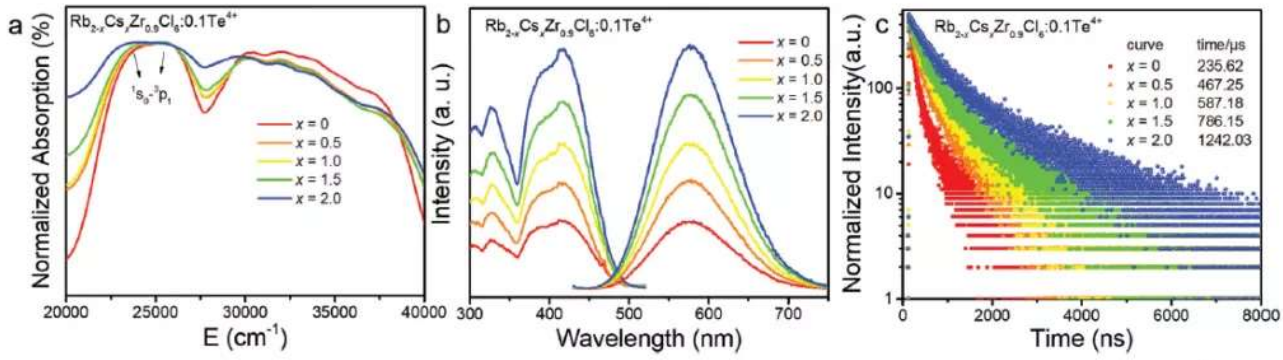


Fig. 4 (a) Room-temperature normalized absorption spectra, (b) PLE and PL spectra, and (c) decay curves of $Rb_{2-x}Cs_xZr_{0.9}Cl_6:0.1Te^{4+}$.

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Cite this: *Mater. Chem. Front.*, 2021, **5**, 6133

Self-trapped exciton to dopant energy transfer in Sb^{3+}-doped Cs_2ZrCl_6 perovskite variants

Jun Zhou, *† Xiangyan Yun,† Ruoyu Wang, Denghui Xu * and Xiong Li

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Accepted 18th June 2021

DOI: 10.1039/d1qm00697e

rsc.li/frontiers-materials

As a promising way to modulate the photoluminescence properties and stability of perovskites and perovskite variants, doping has attracted wide attention in the field of optical and optoelectronic applications. In this work, a series of all inorganic lead-free Sb^{3+}-doped Cs_2ZrCl_6 vacancy-ordered perovskite variants were prepared by the hydrothermal method, and the Sb^{3+}-doping leads to singlet and triplet state emissions, which are strongly dependent on the temperature and surrounding molecular environment. Furthermore, efficient energy transfer can be observed from self-trapped excitons (STEs) of $[ZrCl_6]^{2-}$ octahedra to dopant Sb^{3+}. Our results will shed light on the ns^2 Sb^{3+}-ion-doping-induced emissive mechanism and expand the understanding of the optoelectronic properties of the perovskite variant family.

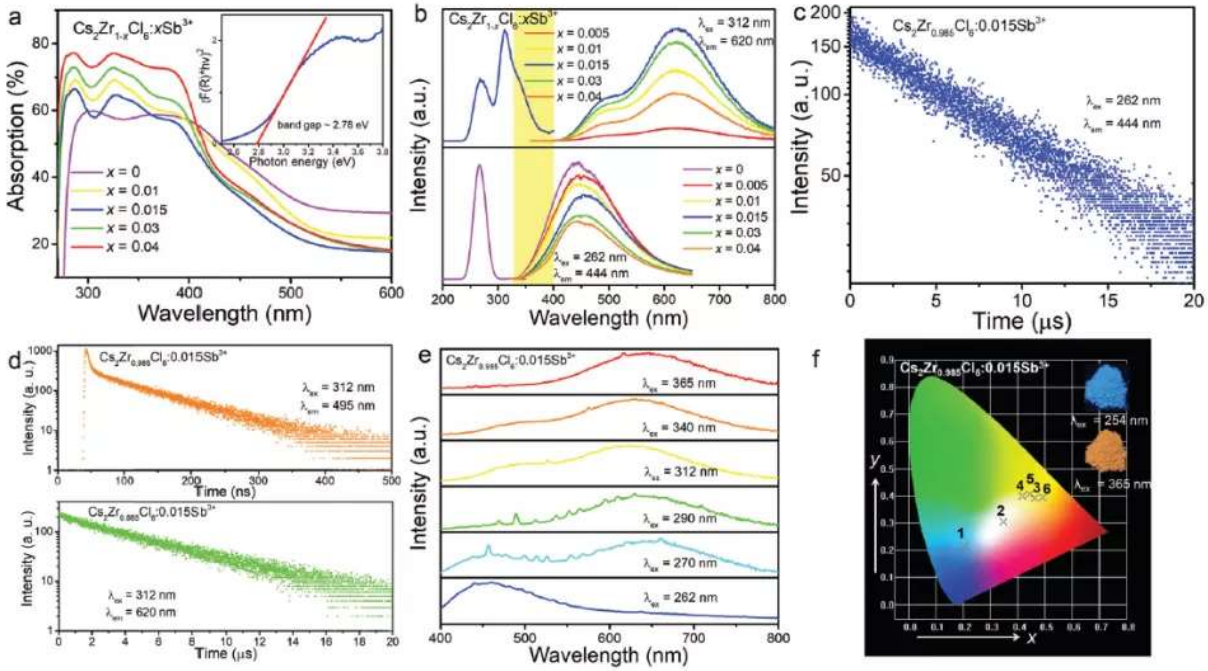


Fig. 2 (a) The absorption spectra of $Cs_2Zr_{1-x}Cl_6$:xSb^{3+}. (b) The PLE and PL spectra of $Cs_2Zr_{1-x}Cl_6$:xSb^{3+}. (c and d) Room-temperature photoluminescence decay curves of $Cs_2Zr_{0.985}Cl_6$:$0.015Sb^{3+}$. (e) Wavelength-dependent PL spectra and (f) CIE chromaticity diagram of $Cs_2Zr_{0.985}Cl_6$:$0.015Sb^{3+}$ (λ_{ex} = 262 nm, 270 nm, 290 nm, 312 nm, 340 nm and 365 nm corresponding to points 1–6).

人工智能学院刘剑副教授发表高水平学术论文

刘剑副教授在国际知名期刊《Soft Matter》上发表学术论文《Correlated continuous-time random walk in the velocity field: the role of velocity and weak asymptotics》，在《Journal of Statistical Mechanics: Theory and Experiment》上发表学术论文《Nontrivial anomalous diffusions induced by the harmonic velocity L´evy noise》。

Soft Matter

ROYAL SOCIETY OF CHEMISTRY

PAPER

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Cite this: *Soft Matter*, 2021, 17, 9786

Correlated continuous-time random walk in the velocity field: the role of velocity and weak asymptotics†

Jian Liu, *[ab] Caiyun Zhang,[ab] Jing-Dong Bao[c] and Xiaosong Chen[d]

Within the framework of a space-time correlated continuous-time random walk model, anomalous diffusion of particles moving in the velocity field is studied in this paper. The weak asymptotic form $\omega(t) \sim t^{-(1+\alpha)}$, $1 < \alpha < 2$ for large t, is considered to be the waiting time distribution. The analytical results reveal that the diffusion in the velocity field, *i.e.*, the mean squared displacement, can display a multi-fractional form caused by dispersive bias and space-time correlation. The numerical results indicate that the multi-fractional diffusion leads to a crossover phenomenon in-between the process at an intermediate timescale, followed by a steady state which is always determined by the largest diffusion exponent term. In addition, the role of velocity and weak asymptotics is discussed. The extremely small fluid velocity can characterize the diffusion by a diffusion coefficient instead of diffusion exponent, which is distinctly different from the former definition. In particular, for the waiting time displaying a weak asymptotic property, if the anomalous part is suppressed by the normal part, a second crossover phenomenon appears at an intermediate timescale, followed by a steady normal diffusion, which implies that the anomalies underlying the process are smoothed out at large timescales. Moreover, we discuss that the consideration of bias and correlation could help to avoid a possible not readily noticeable mistake in studying the topic concerned in this paper, which may be helpful in the relevant experimental research.

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DOI: 10.1039/d1sm00995h

rsc.li/soft-matter-journal

Journal of Statistical Mechanics: Theory and Experiment
An IOP and SISSA journal

PAPER: Classical statistical mechanics, equilibrium and non-equilibrium

Nontrivial anomalous diffusions induced by the harmonic velocity Lévy noise

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Abstract. Moving in the force-free potential and the tilted periodic potential, the diffusion of the under-damped particle subjected to correlated Lévy noise, i.e. the harmonic velocity Lévy noise, is investigated in this paper. We find that the underlying negative time correlation, especially the strong one, distinctly collides with the long-tailed nature of the noise, which results in a multi-diffusive process in the force-free potential. In the tilted periodic potential, strong correlation means that the transport of particle cannot be separated as the typical locked state and running state in coordinate space. Correspondingly, the anomalous diffusion in the tilted periodic potential does not hold anymore, which becomes a normal shape at asymptotic timescale.

Keywords: diffusion, numerical simulations, stochastic particle dynamics

J. Stat. Mech. (2021) 043210

人工智能学院庄会选在高水平期刊发表论文

青年教师庄会选在《International Journal of Control, Automation and Systems》《Aerospace Science and Technology》发表论文，分别对导弹系统和飞机动力系统提出了一种将反步法与线性自抗扰控制（LADRC）相结合的非线性导弹姿态控制方法和鲁棒自适应滑模控制控制（SMC）和反步法应用于飞机系统的姿态控制。分别对线性扩展状态观测器LESO和LADRC的稳定性、自适应律和SMC进行了理论分析和证明，是在控制技术方面的最新研究成果。

计算机学院王晓川发表高水平学术论文

王晓川在国际知名期刊《Computers & Electrical Engineering》上发表了关于计算机多媒体技术的学术论文《基于对抗生成变换的单目视频无监督虚拟视点合成方法》，文中提出一种改进的虚拟视点合成方法，通过将对抗生成网络与基于深度图像的三维变换相结合，实现了无监督的虚拟视点合成，可用于自由视点视频、多视点视频等实际应用场景。

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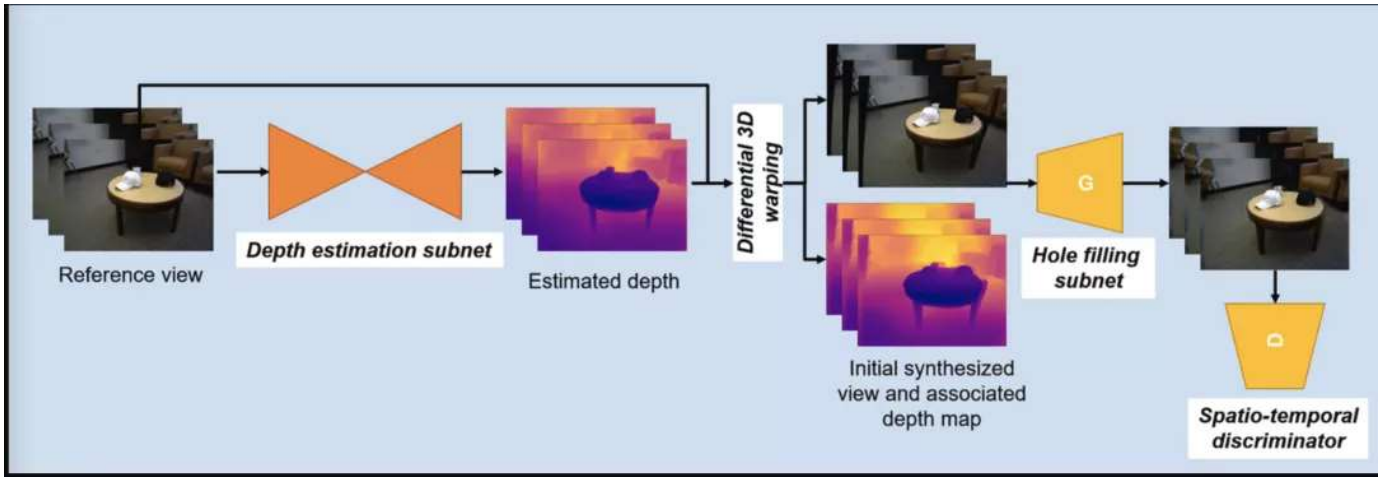


Unsupervised virtual view synthesis from monocular video with generative adversarial warping ☆

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计算机学院李帮庆副教授发表高水平学术论文

李帮庆副教授最近在国际知名磁性材料期刊《Journal of Magnetism and Magnetic Materials》上发表了关于Kraenkel-Manna-Merle (KMM) system铁磁系统振荡怪波的学术论文《Oscillation rogue waves for the Kraenkel-Manna-Merle system in ferrites》。该文采用截断Painleve法获得了KMM铁磁系统的解析怪波解，然后通过可变参数函数激发出新颖的周期振荡怪波解，发现了怪波频率和振幅的可控性。本研究揭示了KMM铁磁系统的怪波生成和传播特性，对提升以铁磁为介质的信息存储器容量有理论指导意义。

论文链接：

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Research articles

Oscillation rogue waves for the Kraenkel–Manna–Merle system in ferrites

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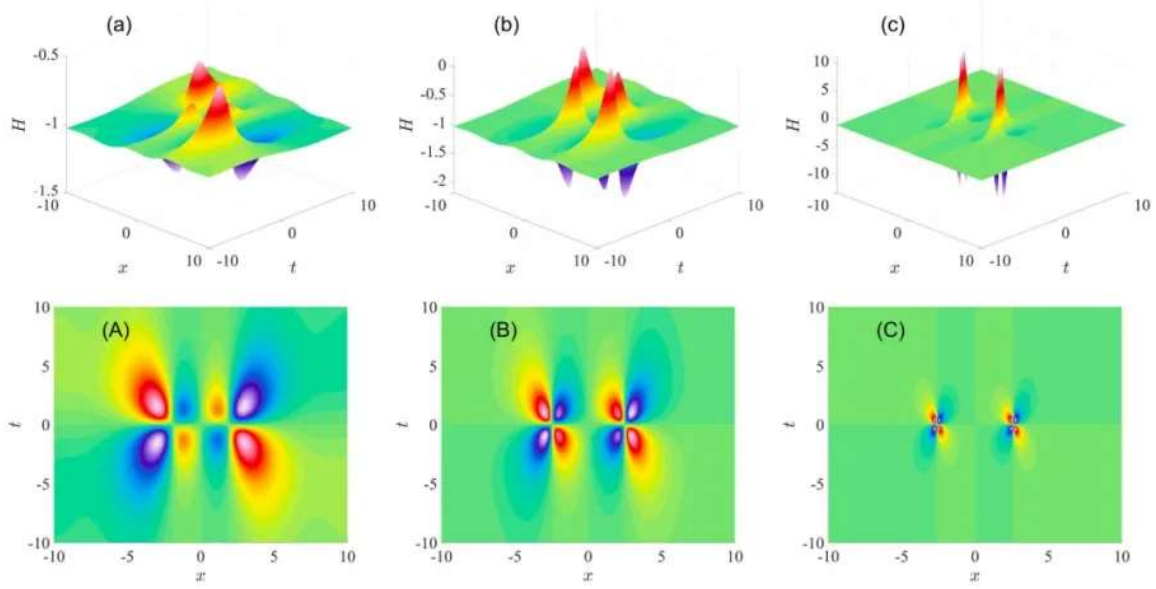


Fig. 3. Periodic oscillation rogue waves of H with changeable frequency along time. The plots are given by (23) and (25) with $\eta_{10} = \eta_{20} = 0, w_1 = w_2 = k_1 = 0.5$, $h = 1, f(x) = 0$, and different $g(t)$: (a) $g(t) = 0.5\cos(2t)$, (b) $g(t) = 0.5\cos(4t)$, (c) $g(t) = 0.5\cos(8t)$. (A)–(C) are the projecting views of (a)–(c) on the $x-t$ plane, respectively.

商学院毛新述教授、王斌教授在国际顶级期刊Management Science发表论文

10月，商学院毛新述教授（通讯作者）、王斌教授与新加坡国立大学柯滨教授、康奈尔大学左罗教授合作的论文《中国公司高管团队权力：测度与验证》（Top Management Team Power in China: Measurement and Validation）在《管理科学》（Management Science）杂志正式发表。Management Science是国际公认的顶级管理学期刊，也是经济管理类国际公认权威期刊目录UT DALLAS 24本期刊之一。该研究第一次针对包括中国在内的亚洲市场的上市公司提出了高管权力的综合测度，并进行了验证，为测度公司高管团队的权力分布及其影响奠定了理论基础和科学方法，对高管团队研究做出了重要贡献。

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Top Management Team Power in China: Measurement and Validation

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Abstract. We propose and validate a comprehensive measure of power for the top management teams (TMTs) of publicly listed Chinese firms. We show that our measure is positively associated with the four power dimensions developed by prior research for U.S. firms as well as three Asia-relevant power dimensions, including political capital, seniority, and gender. We find that our TMT power measure is a valid proxy for TMT power for both state-controlled firms and non-state-controlled firms. We also compare our TMT power measure with one alternative TMT power proxy based on executive compensation and find no evidence that the alternative proxy is better than our measure in capturing TMT's true power. Further, we provide evidence that the divergence between our power proxy and the power proxy based on executive compensation reflects nonmarket institutional forces in China and has important implications for corporate outcomes.

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Supplemental Material: The data files and online appendix are available at https://doi.org/10.1287/mnsc.2020.3798.

Keywords: power • top management team • executive compensation • nonmarket institutional force • China

1. Introduction

The management literature has long recognized the importance of top management teams (hereafter referred to as TMTs) in corporate decision making (e.g., Hambrick and Mason 1984, Cannella et al. 2009). Existing empirical evidence from the management literature suggests that it is the entire TMT rather than the Chief Executive Officer (CEO) alone that determines organizational outcomes (Hage and Dewar 1973, Tushman et al. 1985, Ancona 1990, O'Reilly et al. 1993, Tushman and Rosenkopf 1996). The recent accounting and finance literatures have also started to recognize the importance of top executives other than the CEO to major corporate decisions (Bertrand and Schoar 2003, Graham et al. 2005, Bamber et al. 2010, Dyreng et al. 2010, Ge et al. 2011, Dichev et al. 2013, Schoar et al. 2020). Central to the research on TMTs is the distribution of power among the TMT members because individual top managers are able to influence organizational outcomes only to the extent that they have power.[1] Finkelstein (1992, p. 532) notes that research on TMTs requires a "recognition of the role of power in strategic choice and a means of incorporating power" if stronger predictions of executive effects are to be found.

Unfortunately, it is difficult to incorporate managerial power into large-scale empirical research because managerial power, a multidimensional construct, is unobservable to researchers. One could attempt to use the observable individual power sources to construct a managerial power proxy, but such an approach faces several major obstacles. First, many sources of managerial power are unobservable. Second, even if all the sources of power can be directly measured, it is costly to collect such data for large samples of publicly listed firms (e.g., Finkelstein 1992). Third and more importantly, we do not know how to weigh the individual power sources to derive an overall power score for an executive.

The objective of this study is to propose and validate a comprehensive measure of TMT power. Specifically, we hypothesize that the ordered TMT name

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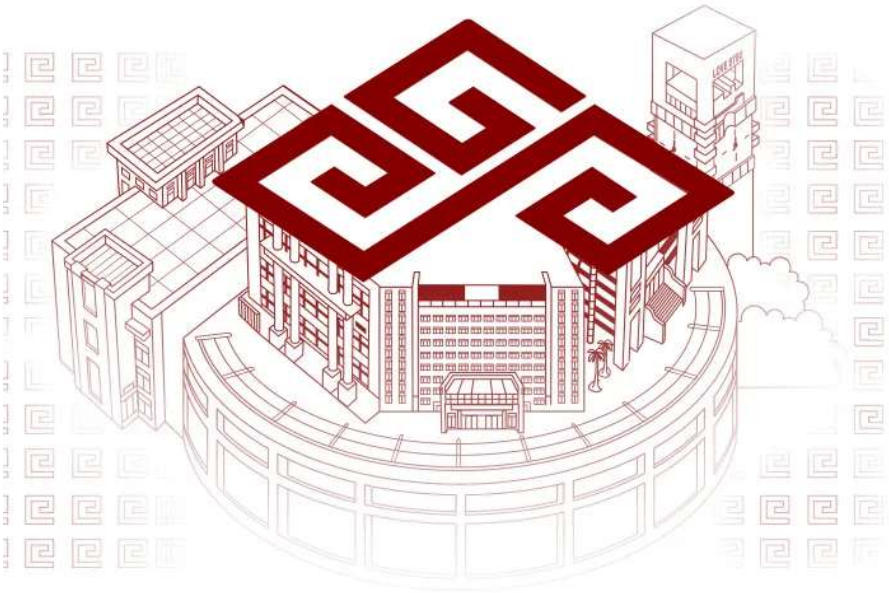
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