Hot Articles

“September | 2020”

Science and Technology

Title: Amphiphilic Calcium Alginate Carbon Aerogels: Broad-Spectrum Adsorbents for Ionic and Solvent Dyes with Multiple Functions for Decolorized Oil–Water Separation

Author: Xiuxiu Tian | Haishan Zhu | Xiao Meng | Jiao Wang | Chenglin Zheng | Yanzhi Xia | Zhong Xiong

Journal: ACS Sustainable Chemistry & Engineering

Volume 8 **Issue:** 34 **Page:** 12755 - 12767

Doi: https://doi.org/10.1021/acssuschemeng.0c00129

Abstract

Development of versatile, broad-spectrum adsorbents for the removal of diverse dyes from contaminated water and oil is highly desirable. In this study, a calcium alginate carbon aerogel (CCA) as an adsorbent for various types of dyes was fabricated from sodium alginate by wet spinning, cross-linking, drying, and high-temperature carbonization. The CCA carbonized at 1000 °C (CCA-1000) showed a good adsorption effect on methylene blue as a cationic dye, methyl orange as an anionic dye, oil red O as a solvent dye, and nine other dyes. Adsorption kinetics, adsorption effect of various parameters such as temperature and solution pH, regeneration performance, and adsorption mechanism were studied. The ultrahigh adsorption capacities of CCA-1000 for malachite green, crystal violet, and acid fuchsin, each with similar triphenylmethane structures, were determined to be 7059, 2390, and 6964 mg g–1, respectively. Interestingly, unlike previously reported carbon aerogels with simple oil–water separation, due to the amphiphilicity, CCA-1000 fabricated herein can be utilized to separate oil–water, surfactant-stabilized water-in-oil, and oil-in-water emulsions with simultaneous dye removal from water and oil. The present work may open up a new avenue for designing carbon aerogels with exceptional performance for broad-spectrum dye adsorption and oil–water separation from sustainable natural seaweed resources.

Database

American Chemical Society Journal (ACS)

Title: ROS-Responsive Polymeric Micelle for Improving Pesticides Efficiency and Intelligent Release

Author: Ruixin Li | Hongguo Xie | Chunguang Zhang | Yeqing Sun | Heng Yin

Journal: Journal of Agricultural and Food Chemistry

Volume 68 **Issue:** 34 **Page:** 9052 - 9060

Doi: https://doi.org/10.1021/acs.jafc.0c03856

Abstract

The low utilization rate of pesticides causes serious problems such as food safety and environmental pollution. Stimulus-responsive release can effectively improve the utilization rate of pesticides. Reactive oxygen species (ROS) burst, as an early event of plant–pathogen interaction, can stimulate the release of pesticides. In this work, a polymeric micelle with ROS-responsive was prepared and then Validamycin (Vail) was loaded into polymeric micelle to prepare Vail-loaded polymeric micelle. The Vail-loaded polymeric micelle displayed excellent ROS-dependent release kinetics. In vitro and in vivo antifungal experiments confirmed that the Vail-loaded polymeric micelle could improve antifungal efficacy against Rhizoctonia solani than with the Vail reagent. Therefore, as a biostimulation and controlled release system, ROS-responsive polymeric micelles can improve the utilization rate of pesticides and alleviate the problem of food safety and environmental pollution.

Database

American Chemical Society Journal (ACS)

Title: Size-Dependent Encapsulation and Release of dsDNA from Cationic Lyotropic Liquid Crystalline Cubic Phases

Author: Sampa Sarkar | Nhiem Tran | Sarvesh Kumar Soni | Charlotte E. Conn | Calum J. Drummond*

Journal: ACS Biomaterials Science & Engineering

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Doi: https://doi.org/10.1021/acsbiomaterials.0c00085

Abstract

The potential of gene therapy has not yet been realized, largely due to difficulties in the targeted delivery of DNA to tissues and cells. Lipid-based nanovectors are of potential use in gene therapy due to their ability to enhance fusion with cellular membranes and transport the large polyanionic DNA molecules into the cytoplasm. While the research to date has mainly focused on liposome-based vectors, recently, nonlamellar phases with more complex internal architectures based on hexagonal or cubic symmetry have received increasing research attention due to their fusogenic properties, which may promote uptake of the DNA into the cell. Herein, we have carried out a fundamental physicochemical study to systematically analyze the encapsulation and release of nonfunctional double-stranded (ds) DNA fragments within monoolein (MO)-based cationic lipid phases of cubic symmetry (cationic cubic phases) and their dispersed submicron particles (cationic cubosomes). MO-based cationic cubic phases, both as the bulk phase and cubosomes, were formulated using six different cationic lipids, and their nanostructure was characterized in a high-throughput manner by synchrotron small-angle X-ray scattering (SAXS). dsDNA encapsulation was confirmed using agarose gel electrophoresis, and the effect on the internal nanostructure, size, and morphology of the cubosomes was investigated using synchrotron SAXS, dynamic light scattering, and cryo-transmission electron microscopy. Synchrotron radiation circular dichroism confirmed that the structure of the dsDNA fragments was unaffected by encapsulation within the cationic cubosome. The use of commercially available dsDNA ladders consisting of a controlled mixture of dsDNA fragments allowed us to determine release rates as a function of fragment size in a reasonably high throughput manner. An improved understanding of the loading capacity and release profile of nonfunctional biomolecules in cationic cubosomes will assist in the design of novel lipid nanovectors for gene delivery.

Database

American Chemical Society Journal (ACS)

Title: Techno-Economic Impact of Filterless Data Plane and Agile Control Plane in the 5G Optical Metro

Author: Pablo Pavon-Marino | Francisco-Javier Moreno-Muro | Miquel Garrich | Marco Quagliotti | Emilio Riccardi | Albert Rafel | Andrew Lord

Journal: Journal of Lightwave Technology

Volume 38 **Issue:** 15 **Page:** 3801 - 3814

Doi: https://doi.org/10.1109/JLT.2020.2982131

Abstract

Optical metro networks evolution driven by 5G requirements face enormous challenges. Network functions virtualized in the data centers spread to the metro nodes, IP, and optical technologies must cooperate to meet the metro traffic aggregation role. Multiple technological options exist, and carriers confront the need to economically assess them, benchmarked in realistic deployments. This paper gives relevant insights to this aim. We first construct a set of metro network benchmarks. A strategic and distinctive effort is made to incorporate metro WDM topologies, traffic profiles and daily variation patterns, fault-tolerance requisites, and network operational choices, that faithfully reflect the expected 5G metro progression for a national carrier. Then, we use these networks to assess two technological choices. On one hand, the cost-effectiveness limits in terms of CAPEX reductions and energy efficiency brought from the possibility of having an agile control plane in the metro, capable of on-demand instantiation of IT and network resources. On the other hand, we investigate the benefits of replacing ROADMs by more cost-effective filterless technologies, but just limiting this replacement to degree-1 and degree-2 optical nodes, that are prevalent (e.g. >50%) in regional metro topologies. A novel capacity planning algorithm has been developed for IT, IP and optical resources allocation and dimensioning, providing fault-tolerant designs for the realistic scenarios defined. Simulation results have been obtained using the Net2Plan NIW (NFV over IP over WDM) open-source framework. Developed algorithms and part of the testing scenarios are available for inspection in public repositories of the EU METRO-HAUL project, the umbrella for our work. Our results show CAPEX benefits in the order of 10% and energy savings in the order of 20-30% stemming from the on-demand resource allocation in the metro. In addition, degree 1 and degree 2 optical nodes have shown to be a sweet spot for applying filterless switching, with mitigated impact of the associated spectrum waste.

Database

IEEE/IET Electronic Library (IEL)

[Science and Technology]

Title: Toward Edge Intelligence: Multiaccess Edge Computing for 5G and Internet of Things

Author: Yaqiong Liu | Mugen Peng | Guochu Shou | Yudong Chen | Siyu Chen

Journal: IEEE Internet of Things Journal

Volume 7 **Issue:** 8 **Page:** 6722 - 6747

Doi: https://doi.org/10.1109/JIOT.2020.3004500

Abstract

To satisfy the increasing demand of mobile data traffic and meet the stringent requirements of the emerging Internet-of-Things (IoT) applications such as smart city, healthcare, and augmented/virtual reality (AR/VR), the fifth-generation (5G) enabling technologies are proposed and utilized in networks. As an emerging key technology of 5G and a key enabler of IoT, multiaccess edge computing (MEC), which integrates telecommunication and IT services, offers cloud computing capabilities at the edge of the radio access network (RAN). By providing computational and storage resources at the edge, MEC can reduce latency for end users. Hence, this article investigates MEC for 5G and IoT comprehensively. It analyzes the main features of MEC in the context of 5G and IoT and presents several fundamental key technologies which enable MEC to be applied in 5G and IoT, such as cloud computing, software-defined networking/network function virtualization, information-centric networks, virtual machine (VM) and containers, smart devices, network slicing, and computation offloading. In addition, this article provides an overview of the role of MEC in 5G and IoT, bringing light into the different MEC-enabled 5G and IoT applications as well as the promising future directions of integrating MEC with 5G and IoT. Moreover, this article further elaborates research challenges and open issues of MEC for 5G and IoT. Last but not least, we propose a use case that utilizes MEC to achieve edge intelligence in IoT scenarios.

Database

IEEE/IET Electronic Library (IEL)

Title: Resource Management in LTE-U Systems: Past, Present, and Future

Author: Rui Liu | Qimei Chen | Guanding Yu | Geoffrey Ye Li | Zhi Ding

Journal: IEEE Open Journal of Vehicular Technology

Volume 1 **Issue:** - **Page:** 1 - 17

Doi: https://doi.org/10.1109/OJVT.2019.2949020

Abstract

With the tremendous growth in mobile data traffic, wireless cellular networks are facing a rigorous challenge to increase network capacity. Despite that many advanced technologies are used, the shortage of spectrum resource is still the main bottleneck for capacity enhancement. To address the challenge, the cellular networks have been motivated to seek for more fruitful radio spectra. Amongst many others, the unlicensed 5 GHz spectrum is a promising candidate due to its low channel attenuation, large available bandwidth, and easy to utilize. Therefore, the innovative technology of long-term evolution (LTE) using the unlicensed spectrum, known as LTE-Unlicensed (LTE-U), has been widely investigated as a promising means to increase the data rate of cellular networks. The unique characteristics of the unlicensed spectrum bring new challenges to resource management in the LTE-U system. During the last few years, there have been a lot of resource management designs for the newly-born but vigorous LTE-U technologies. This paper provides a comprehensive overview of the state-of-the-art resource management scenarios in LTE-U systems, including single small cell base station (SBS), multiple SBSs, device-to-device (D2D) networks, vehicular networks, and unmanned aerial vehicle (UAV) systems. The future research issues of resource management in LTE-U for 5G are also outlined.

Database

IEEE/IET Electronic Library (IEL)

Title: Beliefs about others' global warming beliefs: The role of party affiliation and opinion deviance

Author: Matthew T. Ballew | Seth A. Rosenthal | Matthew H. Goldberg | Abel Gustafson | John E. Kotcher | Edward W. Maibach | Anthony Leiserowitz

Journal: Journal of Environmental Psychology

Volume 70 **Issue:** - **Page:** -

Doi: https://doi.org/10.1016/j.jenvp.2020.101466

Abstract

People often misperceive other people's beliefs about global warming—for instance, underestimating the percentage of people who think global warming is happening. In the U.S., perceptions of others vary across political lines and interact with the extent to which partisans align or deviate from the views of their political ingroup. With an online sample of U.S. adults (N = 1214), we conduct a partial replication and extension of prior research on the relationship between global warming "opinion deviance" (i.e., taking a stance that conflicts with the prototypical views of one's ingroup) and perceptions of other people's views, using a different methodological approach. We found that, compared with partisans who align with the prototypical views of their ingroup (i.e., political party), opinion-deviant partisans consistently perceive a narrower partisan divide across several views (e.g., belief that global warming is happening, belief that it is human-caused, and support for climate policies), even when statistically controlling for self-reported opinion extremity. Additionally, opinion-deviant Republicans, more than opinion-aligned Republicans, perceive that more Republicans hold pro-climate views. Further, among both Republicans and Democrats, perceptions of pro-climate ingroup consensus correlates with both increased activism intentions and frequency of discussing global warming with family and friends. Our results support theoretical perspectives and research on opinion deviance showing that misperceptions of public opinion about global warming vary based on an interaction between an individual's party affiliation and their individual climate beliefs.

Database

ScienceDirect

Title: Climate change, water, and human health research in the Arctic

Author: Sherilee L. Harper | Carlee Wright | Stephanie Masina | ShaugnCogginsa

Journal: Water Security

Volume 10 **Issue:** - **Page:** -

Doi: https://doi.org/10.1016/j.wasec.2020.100062

Abstract

We reviewed the nature, range, and extent of literature on drinking water and human health outcomes in the context of climate change in the Circumpolar North. We used a systematic process to identify and synthesize articles. While the number of climate-water-health articles increased recently, this topic remains under-studied despite the transformational changes that the Circumpolar North has already experienced due to climate change. Of the climate-focused articles, most considered climate change to a major extent and discussed waterborne infections. Research examining and evaluating adaptation options and future impacts at the climate-water-health nexus is absent in the Circumpolar North. Responding to this research gap should become a top priority for research, given the urgent need for this evidence to inform climate change policies, actions, and interventions.

Database

ScienceDirect

Title: A Critical Review of Genome Editing and Synthetic Biology Applications in Metabolic Engineering of Microalgae and Cyanobacteria

Author: I-Son Ng | Batuhan Birol Keskin | Shih-I Tan

Journal: Biotechnology Journal

Volume 15 **Issue:** 8 **Page:** -

Doi: https://doi.org/10.1002/biot.201900228

Abstract

Being the green gold of the future, microalgae and cyanobacteria have recently attracted considerable interest worldwide, for their metabolites such as lipids, protein, pigments, and bioactive compounds have immense potential for sustainable energy and pharmaceutical production capabilities. In the last decades, the efforts attended to enhance the usage of microalgae and cyanobacteria by genetic manipulation, synthetic and metabolic engineering. However, the development of photoautotrophic cell factories have rarely compared to the heterotrophic counterparts due to limited tools, bioinformatics, and multi-omics database. Therefore, recent advances of their genome editing techniques by clustered regularly interspaced short palindromic repeats (CRISPR) technology, and potential applications of their metabolic engineering and regulation approaches are examined in this review. Moreover, the contemporary achievements of synthetic biology approaches of microalgae and cyanobacteria in carbon fixation and sequestration, lipid and triacylglycerol (TAG), and sustainable production of high value-added chemicals, such as carotenoids and docosahexaenoic acid (DHA), have been also discussed. From recent genomic study to trends in metabolic regulation of microalgae and cyanobacteria and a comprehensive assessment of the current challenges and opportunities for microalgae and cyanobacteria is also conducted.

Database

Wiley Online Library

Title: Strawberry fruit (Fragaria x ananassa cv. Romina) extenuates iron-induced cardiac oxidative injury via effects on redox balance, angiotensin-converting enzyme, purinergic activities, and metabolic pathways

Author: Ochuko L. Erukainure | Veronica F. Salau | Ayodeji B. Oyenihi | Ndumiso Mshicileli | Md. Shahidul Islam

Journal: Journal of Food Biochemistry

Volume 44 **Issue:** 8 **Page:** -

Doi: https://doi.org/10.1111/jfbc.13315

Abstract

The potential cardioprotective properties of strawberry fruit (Fragaria x ananassa) (SF) were investigated in cardiac tissues ex vivo. Oxidative injury was induced by incubating freshly harvested cardiac tissue homogenates from healthy Sprague Dawley male rats with 0.1 mM FeSO4 for 30 min at 37°C. The induction of oxidative injury resulted in depleted levels of glutathione, superoxide dismutase, catalase, E-NTPDase activities, and HDL-c, while elevating the levels of malondialdehyde, angiotensin-converting enzyme, acetylcholinesterase, ATPase, lipase activities, cholesterol, triglyceride, and LDL-c. Co-incubation with SF significantly reversed these levels and activities with concomitant depletion of oxidative-induced metabolites and reactivation of oxidative-inactivated pathways, while limiting beta-oxidation of very long chain fatty acids and mitochondrial beta-oxidation of medium-chain saturated fatty acids pathways. These data portray the potential cardioprotective effects of strawberry fruits against oxidative-induced cardiopathy via the attenuation of oxidative stress, inhibition of ACE and acetylcholinesterase activities, and modulation of lipid dysmetabolism.

Database

Wiley Online Library