UNIDAD DE VIGILANCIA TECNOLÓGICA E INTELIGENCIA COMPETITIVA

Microalgas

Septiembre 2017

Ministerio de Agroindustria
Presidencia de la Nación

Participan en Confección y Edición
Juan Ignacio Gori
Fernando Carlos Zelaschi

Contenido

En este boletín se presentan las publicaciones, patentes y noticias de interés del tercer trimestre del año 2017. Asimismo se listan eventos que tendrán lugar en el transcurso del año 2017.

Para acceder a el vínculo de cada publicación copiar el enlace en su navegador de internet.

BIORREMEDIACIÓN

PUBLICACIONES

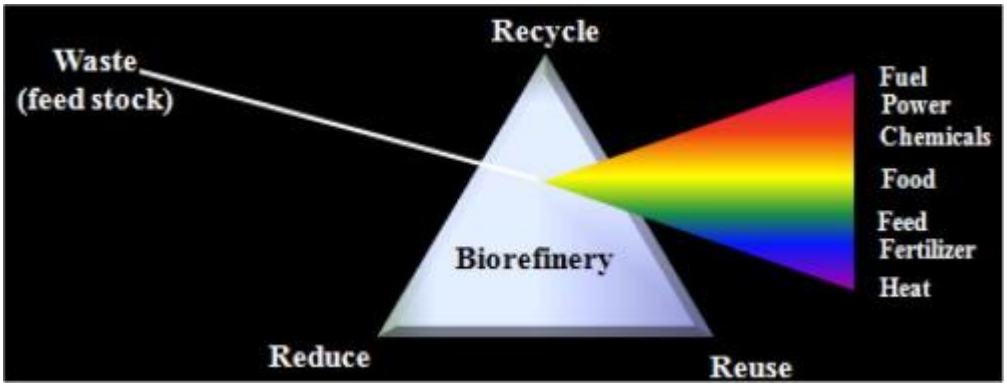
Waste biorefinery models towards sustainable circular bioeconomy: Critical review and future perspectives

Fecha de Publicación: Septiembre 2016
Fuente: Bioresource Technology, Volumen 215
Autor (es): S. Venkata Mohan, G.N. Nikhil, P. Chiranjeevi, C. Nagendranatha Reddy, M.V. Rohit, A. Naresh Kumar, Omprakash Sarkar
Enlace:
http://rss.sciencedirect.com/action/redirectFile?&zone=main&currentActivity=feed&usageType=outward&url=http%3A%2F%2Fwww.sciencedirect.com%2Fscience%3F_ob%3DGatewayURL%26_origin%3DIRSSSEARCH%26_method%3DcitationSearch%26_piikey%3DS0960852416304333%26_version%3D1%26md5%3Dc4f1b874fbda57717dfedae46aa946a8

Abstract

Increased urbanization worldwide has resulted in a substantial increase in energy and material consumption as well as anthropogenic waste generation. The main source for our current needs is petroleum refinery, which have grave impact over energy-environment nexus. Therefore, production of bioenergy and biomaterials have significant potential to contribute and need to meet the ever increasing demand. In this perspective, a biorefinery concept visualizes negative-valued waste as a potential renewable feedstock. This review illustrates different bioprocess based technological models that will pave sustainable avenues for the development of biobased society. The proposed models hypothesize closed loop approach wherein waste is valorised through a cascade of various biotechnological processes addressing circular economy. Biorefinery offers a sustainable green option to utilize waste and to produce a gamut of marketable bioproducts and bioenergy on par to petro-chemical refinery.

Graphical abstract



Utilization of municipal solid and liquid wastes for bioenergy and bioproducts production

Fecha de Publicación: Septiembre 2016
Fuente: Technology, Volumen 215
Autor (es): Paul Chen, Qinglong Xie, Min Addy, Wenguang Zhou, Yuhuan Liu, Yunpu Wang, Yanling Cheng, Kun Li, Roger Ruan
Enlace:
http://rss.sciencedirect.com/action/redirectFile?&zone=main&currentActivity=feed&usageType=outward&url=http%3A%2F%2Fwww.sciencedirect.com%2Fscience%3F_ob%3DGatewayURL%26_origin%3DIRSSSEARCH%26_method%3DcitationSearch%26_piikey%3DS0960852416302310%26_version%3D1%26md5%3Dffdb26bd2dba1165aeec87b6a9052147

Abstract

Municipal wastes, be it solid or liquid, are rising due to the global population growth and rapid urbanization and industrialization. Conventional management practice involving recycling, combustion, and treatment/disposal is deemed unsustainable. Solutions must be sought to not only increase the capacity but also improve the sustainability of waste management. Research has demonstrated that the non-recyclable waste materials and bio-solids can be converted into useable heat, electricity, or fuel and chemical through a variety of processes, including gasification, pyrolysis, anaerobic digestion, and landfill gas in addition to combustion, and wastewater streams have the potential to support algae growth and provide other energy recovery options. The present review is intended to assess and analyze the current state of knowledge in the municipal solid wastes and wastewater treatment and utilization technologies and recommend practical solution options and future research and development needs.

Dual role of microalgae: Phycoremediation of domestic wastewater and biomass production for sustainable biofuels production

Fecha de Publicación: Octubre 2011
Fuente: Applied Energy, Volume 88, Issue 10
Autor (es): I. Rawat, R. Ranjith Kumar, T. Mutanda, F. Bux
Enlace:
http://rss.sciencedirect.com/action/redirectFile?&zone=main&currentActivity=feed&usageType=outward&url=http%3A%2F%2Fwww.sciencedirect.com%2Fscience%3F_ob%3DGatewayURL%26_origin%3DIRSSSEARCH%26_method%3DcitationSearch%26_piikey%3DS0306261910004885%26_version%3D1%26md5%3D8e9ec5ebbc9ea4a45fade192077e4976

Abstract

Global threats of fuel shortages in the near future and climate change due to green-house gas emissions are posing serious challenges and hence and it is imperative to explore means for sustainable ways of averting the consequences. The dual application of microalgae for phycoremediation and biomass production for sustainable biofuels production is a feasible option. The use of high rate algal ponds (HRAPs) for nutrient removal has been in existence for some decades though the technology has not been fully harnessed for wastewater treatment. Therefore this paper discusses current knowledge regarding wastewater treatment using HRAPs and microalgal biomass production techniques using wastewater streams. The biomass harvesting methods and lipid extraction protocols are discussed in detail. Finally the paper discusses biodiesel production via transesterification of the lipids and other biofuels such as biomethane and bioethanol which are described using the biorefinery approach.

Comparative evaluation of piggery wastewater treatment in algal-bacterial photobioreactors under indoor and outdoor conditions

Fecha de Publicación: Disponible online 24 Agosto 2017
Fuente: Bioresource Technology
Autor (es): Dimas García, Esther Posadas, Carlos Grajeda, Saúl Blanco, Sonia Martínez-Páramo, Gabriel Acién, Pedro García-Encina, Silvia Bolado, Raúl Muñoz
Enlace:
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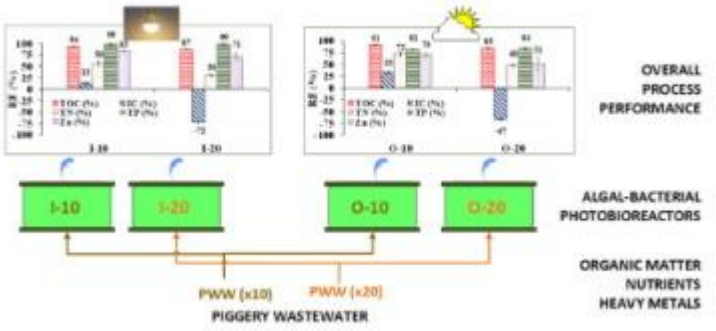
Abstract

This work evaluated the performance of four open algal-bacterial photobioreactors operated at ≈ 26 days of hydraulic retention time during the treatment of 10 (×10) and 20 (×20) times diluted piggery wastewater (PWW) under indoor (I) and outdoor (O) conditions for four months. The removal efficiencies (REs) of organic matter, nutrients and zinc from PWW, along with the dynamics of biomass concentration and structure of algal-bacterial population were assessed. The highest TOC-RE, TP-RE and Zn-RE (94±1%, 100% and 83±2%, respectively) were achieved indoors in ×10 PWW, while the highest TN-RE (72±8%) was recorded outdoors in ×10 PWW. Chlorella vulgaris was the dominant species regardless of the ambient conditions and PWW dilution. Finally, DGGE-sequencing of the bacterial

community revealed the occurrence of four phyla, Proteobacteria being the dominant phylum with 15 out of the 23 most intense bands.

Graphical abstract



Microalgal-bacterial aggregates: Applications and perspectives for wastewater treatment

Fecha de Publicación: 1 Noviembre 2017
Fuente: Biotechnology Advances, Volume 35, Issue 6
Autor (es): Guillermo Quijano, Juan S. Arcila, Germán Buitrón
Enlace:
http://rss.sciencedirect.com/action/redirectFile?&zone=main&currentActivity=feed&usageType=outward&url=http%3A%2F%2Fwww.sciencedirect.com%2Fscience%3F_ob%3DGatewayURL%26_origin%3DIRSSSEARCH%26_method%3DcitationSearch%26_piikey%3DS0734975017300794%26_version%3D1%26md5%3Dbcb8fccd9424b7dc4253a069be966e69

Abstract

Research on wastewater treatment by means of microalgal-bacterial processes has become a hot topic worldwide during the last two decades. Owing to the lower energy demand for oxygenation, the enhanced nutrient removal and the potential for resource recovery, microalgal-based technologies are nowadays considered as a good alternative to conventional activated sludge treatments in many instances. Nevertheless, biomass harvesting still constitutes one of the major challenges of microalgal-bacterial systems for wastewater treatment, which is hindered by the poor settleability of microalgal biomass. In this review, the use of microalgal-bacterial aggregates (MABAs) to overcome harvesting issues and to enhance resource recovery is presented. The fundamentals of MABAs-based technologies, the operational strategies and factors affecting the formation of MABAs, the microbiology and the methanogenic potential of the aggregates are addressed and critically discussed. The most recent findings and the challenges facing this technology towards its consolidation are also presented.

Graphical abstract

Carbon Concentration in Algae: Reducing CO2 From Exhaust Gas

Fecha de Publicación: Septiembre 2017
Fuente: Trends in Biotechnology, Volume 35, Issue 9
Autor (es): Atreyee Ghosh, Bala Kiran
Enlace:
http://rss.sciencedirect.com/action/redirectFile?&zone=main&currentActivity=feed&usageType=outward&url=http%3A%2F%2Fwww.sciencedirect.com%2Fscience%3F_ob%3DGatewayURL%26_origin%3DIRSSSEARCH%26_method%3DcitationSearch%26_piikey%3DS0167779917301117%26_version%3D1%26md5%3Dce4e29339e974e63f06b1b51c8de7918
Abstract

Algal carbon-concentrating mechanisms can be used to sequester CO2 from the atmosphere, and the resulting biomass can produce various value-added products. Mechanisms for carbon concentration in algae are complex and sometimes inefficient. We need to understand how algae successfully overcome these challenges while capturing CO2 from their nearby environment.

Scenedesmus obliquus mediated brewery wastewater remediation and CO2 biofixation for green energy purposes

Fecha de Publicación: 1 Noviembre 2017
Fuente: Journal of Cleaner Production, Volume 165
Autor (es): Alice Ferreira, Belina Ribeiro, Paula A.S.S. Marques, Ana F. Ferreira, Ana Paula Dias, Helena M. Pinheiro, Alberto Reis, Luisa Gouveia
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Abstract

Microalgae can be used for wastewater bioremediation with simultaneous CO2 biofixation producing valuable biomass. Wastewater from a brewery was treated using the Scenedesmus obliquus microalga in bubble-column photobioreactors (PBRs). The PBRs were fed with ambient air and the effect of a 10% (v/v) brewery CO2 supplement was studied. The PBRs were inoculated and a range of mean hydraulic residence time (HRT) values were tested (2.1–10.4 days). The maximum ash-free dry weight (AFDW) biomass productivity was obtained for a HRT of 3.5 days (0.29 d−1 dilution rate; 0.2 g L−1 d−1 (in terms of AFDW). The highest pollutant removal efficiencies were 92.9 and 88.5% for ammonia and total nitrogen, respectively, 40.8% for phosphorus, and 61.9% for COD. Except a dilution rate of 0.48 d−1 trial, the treated wastewater always met the Portuguese legislation quality standard for discharge into natural water bodies. Aiming to simultaneously maximize biomass volumetric productivity, CO2 biofixation rate and wastewater treatment efficiency, while minimizing residence time, 0.29 d−1 represents the optimal dilution rate value. The potential of the produced Scenedesmus obliquus biomass was evaluated for the generation of biohydrogen through dark fermentation with Enterobacter aerogenes, and of bio-oil, bio-char and bio-gas through a pyrolysis process. The yields obtained were 67.1 mL H2 g−1 (in terms of volatile solids - VS) for bioH2 and 64, 30 and 6% for bio-oil, bio-char and bio-gas, respectively (dry mass content (%) calculated over freeze dryer biomass basis).

A systems approach for CO2 fixation from flue gas by microalgae—Theory review

Fecha de Publicación: Noviembre 2016
Fuente: Process Biochemistry, Volume 51, Issue 11
Autor (es): Alexander Dimitrov Kroumov, Aparecido Nivaldo Módenes, Daniela Estelita Goes Trigueros, Fernando Rodolfo Espinoza-Quiñones, Carlos Eduardo Borba, Fabiano Bisinella Scheufele, Camila Larissa Hinterholz
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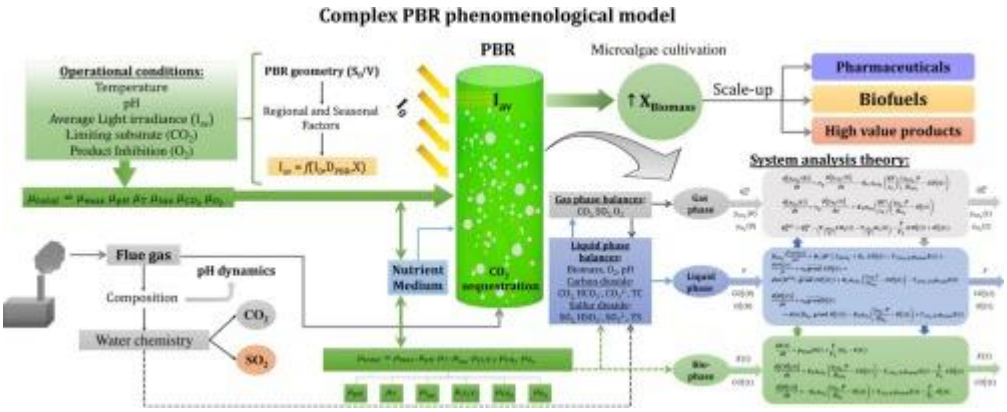
Abstract

Green energy production connected with global warming is one of the hottest topics for industry, technology, and life science. Microalgae culture and its potential for industrial applications in CO2 fixation from flue gases for second generation biofuels and many other valuable metabolites' production has received much attention in recent years. The goal of this review is to combine all the key knowledge obtained in state of the art studies in recent years about the modeling of photobioreactors (PBRs). In order to develop the complex PBR phenomenological model, we considered it as a system and applied the theory of system analysis on PBR. Special attention was given to decomposition principles of this theory where the PBR system was divided into sub-systems. Furthermore, this review shows how to combine the knowledge from modeling of sub-systems by taking into account relationships between them, and how such interrelationships influence the overall PBR modeling procedure for the particular microalgal cultivation process. The result of this work is a

successful development of a complex PBR phenomenological model, which was presented as an independent original authors' work.

Graphical abstract



Efficiency of Microalgae Chlamydomonas on the Removal of Pollutants from Palm Oil Mill Effluent (POME)

Fecha de Publicación: Agosto 2015
Fuente: Energy Procedia, Volume 75
Autor (es): Hesam Kamyab, Mohd Fadhil Md Din, Ali Keyvanfar, Muhd Zaimi Abd Majid, Amirreza Talaiekhozani, Arezou Shafaghat, Chew Tin Lee, Lim Jeng Shiun, Hasrul Haidar Ismail
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Abstract
Malaysia is considered as a major palm oil producer in the world. Therefore, it is vital to utilize an environmentally friendly and inexpensive method to treat palm oil mill effluent (POME) in Malaysia. Nowadays, the use of microalgae to remove pollutants from POME has gained a lot of attention. The main objective of this research was to investigate the effect of POME as a nutrient on the microalgae growth and analyze the removal rate of pollution. In this study, a pure culture Chlamydomonas incerta was aseptically transferred to an Erlenmeyer flask containing POME. The effect of POME as a high nutritional substrate, different cultivation scales, carbon total nitrogen (C:TN) ratio, and the lipid productivity of microalgae C. incerta were assessed. C. incerta was grown at room temperature under continuous illumination with the intensity of ± 15 (µmol/m2/s) for 28 days, followed by the measurement of chemical oxygen demand (COD) reduction at different substrate concentrations. The results of this study demonstrated that organic carbon was removed by C. incerta for the ratio of 100:7, 100:13, and 100:31 respectively within the second day of

cultivation. Fast growth of microalgae was observed in organic and inorganic substrates for adoption within the second day of experiment. The optimum achievement rate of nutrient removal with C. incerta was about 67.35% of COD for 250mg/L of POME concentrations in 28 days. The significance of this study is regarding the introduction of a new microalgae strain with a high ability to remove nutrients from POME, which can contribute to the effort in finding an efficient and economic technology for improving our environment.

Bioremediation and biomass harvesting of anaerobic digested cheese whey in microalgal-based systems for lipid production

Fecha de Publicación: Diciembre 2016
Fuente: Ecological Engineering, Volume 97
Autor (es): B. Riaño, S. Blanco, E. Becares, M.C. García-González
Enlace:
http://rss.sciencedirect.com/action/redirectFile?&zone=main&currentActivity=feed&usageType=outward&url=http%3A%2F%2Fwww.sciencedirect.com%2Fscience%3F_ob%3DGatewayURL%26_origin%3DIRSSSEARCH%26_method%3DcitationSearch%26_piikey%3DS0925857416304773%26_version%3D1%26md5%3D515c20c3f277f2af98f027313d5d3050
Abstract

Agro-industrial wastewaters are potential resources for production of microalgae biofuels. The aim of the present work was to determine the feasibility of a semi-continuously fed microalgal-based system for the treatment of anaerobic digested cheese whey (AD) and to evaluate biomass productivity and lipid accumulation for a period of 77d. The effect of increasing ammonium loading rate (ALR) and decreasing hydraulic retention time (HRT) was evaluated. Maximum biomass productivity and lipid content were 12.0gm−2 d−1 and 12.3%, respectively, achieved when operating at an ALR of 12.9mgL−1 d−1 and at a HRT of 5d. Under these conditions, soluble chemical oxygen demand (SCOD), ammonium and soluble phosphorous (SP) removal accounted for 94%, 92% and 20%, respectively. Additionally, the effectiveness of flocculation induced by increase pH to harvest produced biomass was investigated. Flocculation efficiencies up to 90% were obtained for a pH of 13.5 regardless culture broth characteristics, and therefore, this process can be used as a pre-concentrated step of microalgal-bacterial suspensions.

Hydrolysis of microalgal biomass using ruminal microorganisms as a pretreatment to increase methane recovery

Fecha de Publicación: Noviembre 2017
Fuente: Bioresource Technology, Volume 244, Part 1
Autor (es): Martín Barragán-Trinidad, Julián Carrillo-Reyes, Germán Buitrón
Enlace:
http://rss.sciencedirect.com/action/redirectFile?&zone=main&currentActivity=feed&usageType=outward&url=http%3A%2F%2Fwww.sciencedirect.com%2Fscience%3F_ob%3DGateway

URL%26_origin%3DIRSSSEARCH%26_method%3DcitationSearch%26_piikey%3DS0960852417312336%26_version%3D1%26md5%3Df6dcf75b287d6eb9f5c7e9abef5777b8

Abstract

The use of ruminal fluid as a source of hydrolytic microorganisms for the pretreatment of a native consortium of microalgae (essentially Senedesmus) was investigated. The hydrolytic enzyme activity of the ruminal culture was first enriched in a bioreactor. Then, using the enriched culture, the effect of the microalgae to the ruminal fluid ratio (S/X) on the hydrolysis and subsequent production of methane was investigated. An S/X ratio of 0.5 showed the best hydrolysis efficiency (29%) reaching in a second stage process a methane yield of 193mL CH4 g COD−1. The processing time (pretreatment plus methanization) was only 7days. The predominant ruminal hydrolytic bacteria selected in the enrichment were principally Clostridium, Proteocatella and Pseudomonas.

Short and long-term experiments on the effect of sulphide on microalgae cultivation in tertiary sewage treatment

Fecha de Publicación: Noviembre 2017
Fuente: Bioresource Technology, Volume 244, Part 1
Autor (es): J. González-Camejo, R. Serna-García, A. Viruela, M. Pachés, F. Durán, A. Robles, M.V. Ruano, R. Barat, A. Seco
Enlace:
http://rss.sciencedirect.com/action/redirectFile?&zone=main&currentActivity=feed&usageType=outward&url=http%3A%2F%2Fwww.sciencedirect.com%2Fscience%3F_ob%3DGatewayURL%26_origin%3DIRSSSEARCH%26_method%3DcitationSearch%26_piikey%3DS0960852417312427%26_version%3D1%26md5%3D3c8fb8cd98b6b2c9d373745f631bcd3e

Abstract

Microalgae cultivation appears to be a promising technology for treating nutrient-rich effluents from anaerobic membrane bioreactors, as microalgae are able to consume nutrients from sewage without an organic carbon source, although the sulphide formed during the anaerobic treatment does have negative effects on microalgae growth. Short and long-term experiments were carried out on the effects of sulphide on a mixed microalgae culture. The short-term experiments showed that the oxygen production rate (OPR) dropped as sulphide concentration increased: a concentration of 5mgSL−1 reduced OPR by 43%, while a concentration of 50mgSL−1 came close to completely inhibiting microalgae growth. The long-term experiments revealed that the presence of sulphide in the influent had inhibitory effects at sulphide concentrations above 20mgSL−1 in the culture, but not at concentrations below 5mgSL−1. These conditions favoured Chlorella growth over that of Scenedesmus.

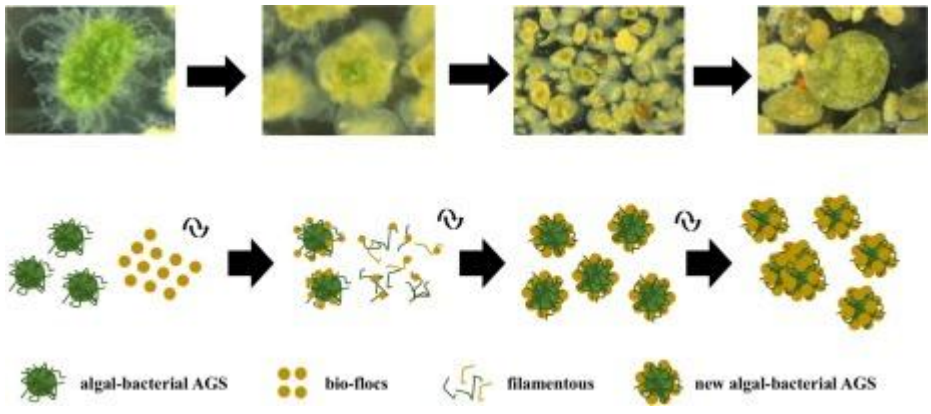
Stability of algal-bacterial granules in continuous-flow reactors to treat varying strength domestic wastewater

Fecha de Publicación: Noviembre 2017
Fuente: Bioresource Technology, Volume 244, Part 1
Autor (es): Johan Syafri Mahathir Ahmad, Wei Cai, Ziwen Zhao, Zhenya Zhang, Kazuya Shimizu, Zhongfang Lei, Duu-Jong Lee
Enlace:
http://rss.sciencedirect.com/action/redirectFile?&zone=main&currentActivity=feed&usageType=outward&url=http%3A%2F%2Fwww.sciencedirect.com%2Fscience%3F_ob%3DGatewayURL%26_origin%3DIRSSSEARCH%26_method%3DcitationSearch%26_piikey%3DS0960852417312506%26_version%3D1%26md5%3D2c787f0eb618782531cd5639138a71c6

Abstract

Stability of algal-bacterial granules was investigated in two continuous-flow systems to treat synthetic domestic wastewater using single (R1) and series (R2 =R2-1 +R2-2 with automatically internal recirculation) reactors by seeding 50% (w/w) algal-bacterial granules. Almost similar organics and phosphorus removal efficiencies were obtained from the two systems, with no significant difference found for each between the designed two operation stages. However, R2 exhibited superior performance on total nitrogen (TN) removal (76%). When double increased strength influent fed to R1, R1 achieved better denitrification with TN removal increased from 29% to 80%, possibly due to the increased influent organics concentration favored the denitrification process. Most importantly, the two systems well maintained their granular stability, and all granules became algal-bacterial ones with very little change detected in algae content in granules after 120days' operation. At last, the mechanisms were proposed regarding the formation and enhanced stability of new algal-bacterial granules in continuous-flow reactors.

Graphical abstract



A simplified process of swine slurry treatment by primary filtration and Haematococcus pluvialis culture to produce low cost astaxanthin

Fecha de Publicación: Mayo 2016
Fuente: Ecological Engineering, Volume 90
Autor (es): Claudio Ledda, Jessica Tamiazzo, Maurizio Borin, Fabrizio Adani
Enlace:
http://rss.sciencedirect.com/action/redirectFile?&zone=main&currentActivity=feed&usageType=outward&url=http%3A%2F%2Fwww.sciencedirect.com%2Fscience%3F_ob%3DGatewayURL%26_origin%3DIRSSSEARCH%26_method%3DcitationSearch%26_piikey%3DS0925857416300337%26_version%3D1%26md5%3D817a36ee5e083635bb92bad58adc2c7b

Abstract

A simplified process for treating swine slurry through primary filtration and subsequent depuration of the filtrate with the astaxanthin-rich microalga Haematococcus pluvialis is proposed. The first step comprises a low-cost filtration system capable of reducing 66% of ammonia, 7% of phosphorus and 19% of chemical oxygen demand, and increasing the concentration of nitrate, being this useful for subsequent growth of the algae. The second step comprises the discontinuous cultivation of H. pluvialis in diluted filtered slurry. The optimal dilution was researched by testing undiluted and 2, 4 and 8-fold diluted filtrate. This step led to a drastic reduction in macro and micronutrients concentration (up to 99% for NO3-N and NH4-N, 98% for TP and 26% for chemical oxygen demand). After H. pluvialis growth the accumulation of astaxanthin took place for 14d in nutrient-deprived conditions: an astaxanthin accumulation of 1.27% on a dry weight basis was measured. These results indicate the possibility to couple low-cost filtration and microalgae production to recover nutrients from swine wastewaters and to add value by producing valuable astaxanthin for the feed market or for an on-farm utilization as feed addictive.

Assessment of a sulfidogenic system utilizing microalgal biomass of Chlorella pyrenoidosa as an electron donor: Taguchi based grey relational analysis

Fecha de Publicación: Disponible online 30 Agosto 2017
Fuente: International Journal of Hydrogen Energy
Autor (es): K. Vasantharaj, M. Jerold, B. Deepanraj, M. Velan, V. Sivasubramanian
Enlace:
http://rss.sciencedirect.com/action/redirectFile?&zone=main&currentActivity=feed&usageType=outward&url=http%3A%2F%2Fwww.sciencedirect.com%2Fscience%3F_ob%3DGatewayURL%26_origin%3DIRSSSEARCH%26_method%3DcitationSearch%26_piikey%3DS0360319917331567%26_version%3D1%26md5%3Dac2abaa4043f0dd56428fd71d4016834

Abstract

This study assessed remediation of sulfate-rich wastewater using microalgal biomass of Chlorella pyrenoidosa as the sole electron donor for sulfidogenic enrichment culture obtained from lignite mine spoils (NLC India Ltd.). Phylogenetic analysis of 16S rRNA gene

showed that the microbial culture used, mainly composed of bacteria closely related to Desulfovibrio sp.. An L9 orthogonal array was selected and designed for three parameters varied through three levels by applying Taguchi's design of experiments. The influence of inoculum size (% v/v), initial COD (mg/L) and incubation time (days) on sulfate reduction (%) and COD removal (%) was experimentally investigated. A maximum of 70.29% of COD removal was achieved and the corresponding sulfate reduction was 60.81%. The EDX qualitative analysis of sulfide precipitate confirmed the removal of S and metals such as Fe, Na and Mg from wastewater. Grey relational analysis was coupled to obtain a grey relational grade for evaluating multiple outputs. The percentage contribution of each parameter on grey relational grade was assessed using ANOVA. The results showed that initial COD contributes much towards sulfate reduction (%) followed by inoculum size and incubation time.

Influence of light intensity and tannery wastewater concentration on biomass production and nutrient removal by microalgae Scenedesmus sp

Fecha de Publicación: Disponible Online 2 Agosto 2017
Fuente: Process Safety and Environmental Protection
Autor (es): Juliana Tolfo da Fontoura, Guilherme Sebastião Rolim, Marcelo Farenzena, Mariliz Gutterres
Enlace:
http://rss.sciencedirect.com/action/redirectFile?&zone=main&currentActivity=feed&usageType=outward&url=http%3A%2F%2Fwww.sciencedirect.com%2Fscience%3F_ob%3DGatewayURL%26_origin%3DIRSSSEARCH%26_method%3DcitationSearch%26_piikey%3DS0957582017302380%26_version%3D1%26md5%3D616f8ffa3e63fbf36959a35d7e17ed74

Abstract

Due to the absorption capacity of nutrients by microalgae, their uses for industrial wastewater treatment have shown increasing interest in research. Tannery wastewaters have high organic content and are rich in nitrogenous compounds which are essential for microalgae cultivation. Thus, the aim of this study was to use tannery wastewater as alternative cultivation medium for microalgae biomass production aiming to treat this effluent. Biomass production and removal of ammoniacal nitrogen, phosphorus and chemical oxygen demand by the microalgae Scenedesmus sp., cultivated in tannery wastewater, was studied under different wastewater concentrations (between 20% and 100%), light intensity (between 80 and 200 µmol photons m−2 s−1) at temperature of 25 °C and constant aeration. The results showed that the adaptation of microalgae for this nutrient source was effective. The cultivation of Scenedesmus sp. showed maximum biomass concentration (0.90 g L−1) and maximum removal of ammoniacal nitrogen (85.63%), phosphorus (96.78%) and COD (80.33%) at a tannery wastewater of 88.4% and light intensity of 182.5 µmol photons m−2 s−1.

Recent bioreduction of hexavalent chromium in wastewater treatment: A review

Fecha de Publicación: 25 Noviembre 2017
Fuente: Journal of Industrial and Engineering Chemistry, Volume 55
Autor (es): Debabrata Pradhan, Lala Behari Sukla, Matthew Sawyer, Pattanathu K.S.M. Rahman
Enlace:
http://rss.sciencedirect.com/action/redirectFile?&zone=main&currentActivity=feed&usageType=outward&url=http%3A%2F%2Fwww.sciencedirect.com%2Fscience%3F_ob%3DGatewayURL%26_origin%3DIRSSSEARCH%26_method%3DcitationSearch%26_piikey%3DS1226086X17303295%26_version%3D1%26md5%3D7ab6c8a5aabfc68547b0daa7d1edda72

Abstract

Hexavalent chromium (Cr(VI)) in water is a proven carcinogen to different internal and external organs of the living organisms. There are different human activities incorporated to the anthropogenic sources in the environment enriching Cr(VI) of high concentration in the water system above the regulatory level. The physical, chemical and biological properties of chromium favour the dissolution in the water environment. This concerns the environmental researcher to tackle and mitigate. Chemical or biological techniques or a combination of the two have been used to remove Cr(VI) from polluted waters. Biological techniques include integrated bioremediation, such as the primary processes of direct bioreduction and biosorption, and secondary processes of microbial fuel cell, biostimulation, surface modified dry biomass and biochar adsorption, and engineered biofilm and cell free reductase. These techniques are used by a wide range of living organisms including bacteria, fungi, plants, plant leaves, plant nuts and algae. This group of living organisms transform and remove Cr(VI) from water during the cellular metabolisms, extracellular activities, physical and chemical adsorptions on the cell surface, and photosynthesis. Variation of different physical, chemical and environmental parameters affecting the efficiency of the bioremediation process have impacted on the design of bioreactors. There has been a recent development of a microbial fuel cell which use the proximity of Cr(VI) reduction as a cathode half cell for the generation of renewable energy and simulation of its' removal from water.

Biosorption mechanisms involved in immobilization of soil Pb by Bacillus subtilis DBM in a multi-metal-contaminated soil

Fecha de Publicación: 1 Octubre 2014
Fuente: Journal of Environmental Sciences, Volume 26, Issue 10
Autor (es): Jun Bai , Xiuhong Yang , Ruiying Du , Yanmei Chen , Shizhong Wang , Rongliang Qiu
Enlace:
http://rss.sciencedirect.com/action/redirectFile?&zone=main&currentActivity=feed&usageType=outward&url=http%3A%2F%2Fwww.sciencedirect.com%2Fscience%3F_ob%3DGatewayURL%26_origin%3DIRSSSEARCH%26_method%3DcitationSearch%26_piikey%3DS1001074214001120%26_version%3D1%26md5%3D8c1679a04e3e7d72b667776542d81657

Abstract

Mechanisms of soil Pb immobilization by Bacillus subtilis DBM, a bacterial strain isolated from a heavy-metal-contaminated soil, were investigated. Adsorption and desorption experiments with living bacterial cells as well as dead cells revealed that both extracellular adsorption and intracellular accumulation were involved in the Pb2+ removal from the liquid phase. Of the sequestered Pb(II), 8.5% was held by physical entrapment within the cell wall, 43.3% was held by ion-exchange, 9.7% was complexed with cell surface functional groups or precipitated on the cell surface, and 38.5% was intracellularly accumulated. Complexation of Pb2+ with carboxyl, hydroxyl, carbonyl, amido, and phosphate groups was demonstrated by Fourier transform infrared spectroscopic analysis. Precipitates of Pb5(PO4)3OH, Pb5(PO4)3Cl and Pb10(PO4)6(OH)2 that formed on the cell surface during the biosorption process were identified by X-ray diffraction analysis. Transmission electron microscopy–energy dispersive spectroscopic analysis confirmed the presence of the Pb(II) precipitates and that Pb(II) could be sequestered both extracellularly and intracellularly. Incubation with B. subtilis DBM significantly decreased the amount of the weak-acid-soluble Pb fraction in a heavy-metal-contaminated soil, resulting in a reduction in Pb bioavailability, but increased the amount of its organic-matter-bound fraction by 71%. The ability of B. subtilis DBM to reduce the bioavailability of soil Pb makes it potentially useful for bacteria-assisted phytostabilization of multi-heavy-metal-contaminated soil.

Food waste biorefinery: Sustainable strategy for circular bioeconomy

Fecha de Publicación: Disponible online 2 Agosto 2017
Fuente: Bioresource Technology
Autor (es): Shikha Dahiya, A. Naresh Kumar, J. Shanthi Sravan, Sulogna Chatterjee, Omprakash Sarkar, S. Venkata Mohan
Enlace:
http://rss.sciencedirect.com/action/redirectFile?&zone=main&currentActivity=feed&usageType=outward&url=http%3A%2F%2Fwww.sciencedirect.com%2Fscience%3F_ob%3DGatewayURL%26_origin%3DIRSSSEARCH%26_method%3DcitationSearch%26_piikey%3DS0960852417312920%26_version%3D1%26md5%3Dc5eea737b8bb41c45dfbad27a1d72dfc
Abstract

Enormous quantity of food waste (FW) is becoming a global concern. To address this persistent problem, sustainable interventions with green technologies are essential. FW can be used as potential feedstock in biological processes for the generation of various biobased products along with its remediation. Enabling bioprocesses like acidogenesis, fermentation, methanogenesis, solventogenesis, photosynthesis, oleaginous process, bio-electrogenesis, etc., that yields various products like biofuels, platform chemicals, bioelectricity, biomaterial, biofertilizers, animal feed, etc can be utilized for FW valorisation. Integrating these bioprocesses further enhances the process efficiency and resource recovery sustainably. Adapting biorefinery strategy with integrated approach can lead to the development of circular bioeconomy. The present review highlights the various enabling bioprocesses that can be employed for the generation of energy and various commodity chemicals in an integrated approach addressing sustainability. The waste biorefinery approach for FW needs

optimization of the cascade of the individual bioprocesses for the transformation of linear economy to circular bioeconomy.

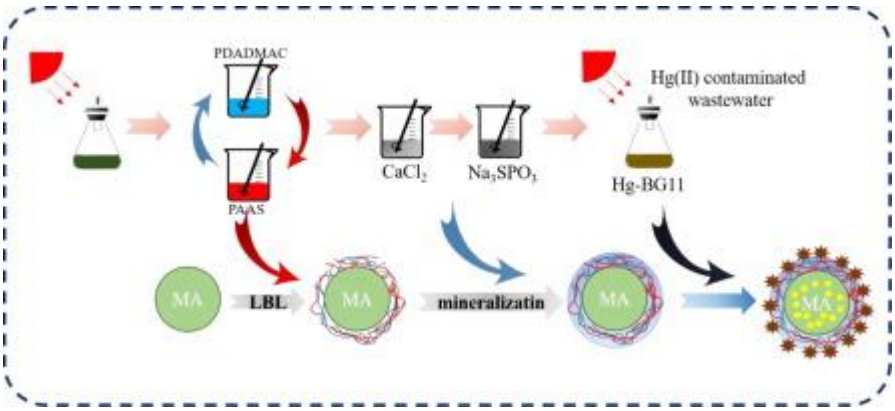
Coupling process study of lipid production and mercury bioremediation by biomimetic mineralized microalgae

Fecha de Publicación: Noviembre 2017
Fuente: Bioresource Technology, Volume 243
Autor (es): Yang Peng, Aosong Deng, Xun Gong, Xiaomin Li, Yang Zhang
Enlace:
http://rss.sciencedirect.com/action/redirectFile?&zone=main&currentActivity=feed&usageType=outward&url=http%3A%2F%2Fwww.sciencedirect.com%2Fscience%3F_ob%3DGatewayURL%26_origin%3DIRSSSEARCH%26_method%3DcitationSearch%26_piikey%3DS0960852417310696%26_version%3D1%26md5%3D37e04800abd8e14928bf2d2cab8afcbd

Abstract

Considering the high concentration of mercury in industrial wastewater, such as coal-fired power plants and gold mining wastewater, this research study investigated the coupling process of lipid production and mercury bioremediation using microalgae cells. Chlorella vulgaris modified by biomimetic mineralization. The cultivation was divided in two stages: a natural cultivation for 7days and 5days of Hg2+ addition (10–100μg/L) for cultivation at different pH values (4–7) after inoculation. Next, the harvested cells were eluted, and lipid was extracted. The fluorescein diacetate (FDA) dye tests demonstrated that the mineralized layer enhanced the biological activity of microalgae cells in Hg2+ contaminated media. Hg distribution tests showed that the Hg removal capacity of modified cells was increased from 62.85% to 94.74%, and 88.72% of eluted Hg2+ concentration was observed in modified cells compared to 48.42% of raw cells, implying that more mercury was transferred from lipid and residuals into elutable forms.

Graphical abstract



Separation of carbon dioxide for biogas upgrading to biomethane

Fecha de Publicación: 15 Octubre 2017
Fuente: Journal of Cleaner Production, Volume 164
Autor (es): Francesco Ferella, Alessandro Puca, Giuliana Taglieri, Leucio Rossi, Katia Gallucci
Enlace:
http://rss.sciencedirect.com/action/redirectFile?&zone=main&currentActivity=feed&usageType=outward&url=http%3A%2F%2Fwww.sciencedirect.com%2Fscience%3F_ob%3DGatewayURL%26_origin%3DIRSSSEARCH%26_method%3DcitationSearch%26_piikey%3DS0959652617314658%26_version%3D1%26md5%3D12a5e71842d10b992043b252cc97bcaa

Abstract

The present paper deals with carbon dioxide capture from dry CO2/CH4 mixtures by means of zeolites produced from spent power plant fly ash. Commercial sorbents such as activated carbon, silica gel and zeolite 13X were also tested. At an operating pressure of 2 bar, the best zeolite synthesized in this work gave rise to recoveries of CH4 and CO2 of 95.2% and 98.1% respectively, at purities of 98 vol% and 99.6 vol% respectively. Among the commercial sorbents tested at 2 bar pressure, the best one was silica gel, with recoveries of CH4 and CO2 of 85.4% and 97.6% respectively at purities of 97.3 vol% and 94.9 vol% respectively. At this pressure, the CO2 adsorption rate was 0.402 moL/kg silica sorbent; at 6 bar this increased to 1.076 mol CO2/kg silica sorbent but at greatly reduced levels of both CH4recovery and CO2 purity. Three zeolites produced from fly ash also underwent PSA (Pressure Swing Adsorption) tests: after five adsorption-desorption cycles no loss in adsorption capacity of CO2 was observed, both activity and selectivity recovering completely after regeneration.

Accumulation of zinc protects against cadmium stress in photosynthetic Euglena gracilis

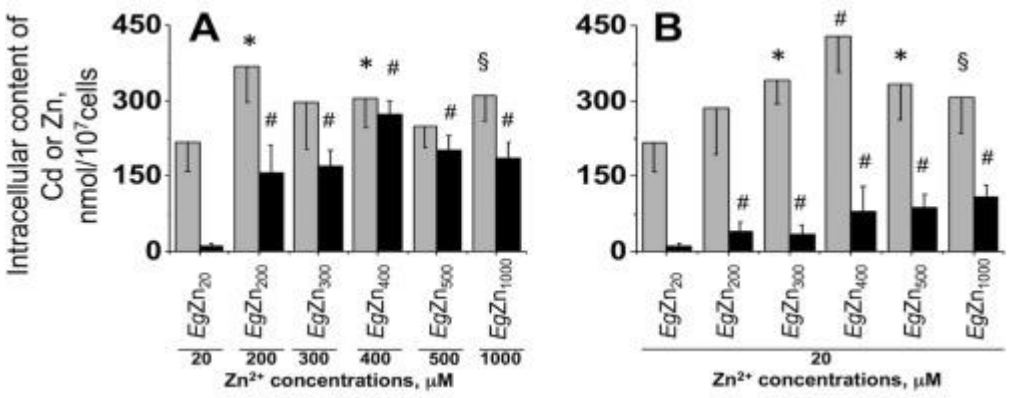
Fecha de Publicación: Noviembre 2016
Fuente: Environmental and Experimental Botany, Volume 131
Autor (es): R. Sánchez-Thomas, R. Moreno-Sánchez, J.D. García-García
Enlace:
http://rss.sciencedirect.com/action/redirectFile?&zone=main&currentActivity=feed&usageType=outward&url=http%3A%2F%2Fwww.sciencedirect.com%2Fscience%3F_ob%3DGatewayURL%26_origin%3DIRSSSEARCH%26_method%3DcitationSearch%26_piikey%3DS009884721630123X%26_version%3D1%26md5%3D316625430f4023e1e70f9f1bad62d6ba

Abstract

To determine the interplay between zinc and cadmium on the heavy metal accumulation capacity of Euglena gracilis, the effects of increasing Zn2+ concentrations (13–65.4ppm or 200–1,000µM) were analyzed on growth; O2 consumption; photosynthesis; ascorbate (APX) and glutathione peroxidase (GPX) activities; chlorophyll a and b (Chl a+b) content; essential metals, thiol-metabolites and polyphosphates (polyPs) levels; as well as on zinc and cadmium accumulation capacities. Control cells (EgZn20; grown with 20µM Zn2+) showed a half-maximal inhibition of growth (IC50) of 1,700µM by external Zn2+. O2 consumption, and

APX and GPX activities were unaltered by Zn2+ treatments. Cells cultured with 500 or 1,000μM Zn2+ showed photosynthesis impairment but normal Chl a+b contents. Zn2+ preconditioning increased the intracellular contents of zinc (25–54 times) and calcium (2–27 times); thiol-metabolites and polyPs were only marginally altered. The growth of cells preconditioned to 400μM Zn2+ (EgZn400 cells) was less susceptible to Cd2+ than that of EgZn20 cells, although no differences in photosynthesis and respiration were observed. In cells chronically grown with Zn2+, the cadmium accumulation capacity was unchanged or slightly increased in the same culture media with high Zn2+, and increased by 42–90% in media with 20μM Zn2+. The thiol-metabolites increased at similar levels in both EgZn20 and EgZn400 cells when further exposed to 200μM Cd2+ and polyPs were at high levels independently of Zn2+ or Cd2+ treatments. It was concluded that chronic exposure to high Zn2+ (1) was innocuous for E. gracilis at concentrations lower than 0.5mM and (2) promoted protection against Cd2+ toxicity and increased cadmium accumulation; and (3) these zinc effects involved GSH and polyPs metabolism and were associated with high intracellular zinc contents.

Graphical abstract



Interaction of veterinary antibiotic tetracyclines and copper on their fates in water and water hyacinth (Eichhornia crassipes)

Fecha de Publicación: 15 Septiembre 2015
Fuente: Journal of Hazardous Materials, Volume 280
Autor (es): Xin Lu , Yan Gao , Jia Luo , Shaohua Yan , Zed Rengel , Zhenhua Zhang
Enlace:
http://rss.sciencedirect.com/action/redirectFile?&zone=main&currentActivity=feed&usageType=outward&url=http%3A%2F%2Fwww.sciencedirect.com%2Fscience%3F_ob%3DGatewayURL%26_origin%3DIRSSSEARCH%26_method%3DcitationSearch%26_piikey%3DS0304389414006785%26_version%3D1%26md5%3D4ffb9ce6137a94fc7c6998a6e8ed7cd4

Abstract

Water hyacinth (Eichhornia crassipes) may provide an alternative solution for the removal of co-contamination between antibiotics and heavy metals from livestock and poultry

wastewater. A hydroponic experiment was conducted to investigate interaction of tetracyclines (TCs) and copper (Cu) on growth of E. crassipes, removal of TCs and Cu by plants and their fates in solution. After 20 days, plant growth, concentrations and accumulation of Cu and TCs in plants, removal by plants, and dissipation in solution were significantly influenced by interaction of Cu and TCs. Influence of only Cu or TCs on plant growth was not significant, except for TCs at 15mgL−1 which produced a negative effect on plant biomass. The presence of low-Cu and high-TCs acted synergistically to promote the negative effect of TCs on plant biomass, but increasing Cu concentration partially alleviated the adverse effect. Co-contamination of low-concentration Cu and TCs could exert antagonistic effects on the removal and accumulation of Cu and TCs by plants; in contrast, synergistic effects were found for the combination of high-concentration Cu and TCs. The Cu/TCs in solution could effectively be removed using E. crassipes. Plants significantly enhanced dissipation of TCs in solution. Hence, interaction of TCs and Cu should be taken into consideration when judging (1) an ecotoxicological potential of TCs and Cu residues in aquatic environments, and (2) removal efficiency of TCs and Cu in phytoremediation.

A Verhulst Model for Microalgae Botryococcus Sp. Growth and Nutrient Removal in Wastewater

Fecha de Publicación: Septiembre 2017
Fuente: American Institute of Physics
Autor(es): Siti Suhana Jamaian, Noorhadila Mohd Bakeri, Norshuhaila Mohamed Sunar & Paran Gani
Enlace:
http://syndic8.scopus.com/action/redirectFile?&zone=main&currentActivity=feed&usageType=outward&url=https%3A%2F%2Fwww.scopus.com%2Finward%2Frecord.uri%3Feid%3D2-s2.0-85028311870%26rel%3DR4.0.0%26partnerID%3D35%26md5%3D2490f3c972d06e9426648ba0130c00d1

Abstract

Microalgae Botryococcus sp. is a colonial green alga found in lakes and reservoirs in Malaysia. Previous studies reported that the potential of Botryococcus sp. photosynthesis as a source of fuel. The Botryococcus sp. contains hydrocarbon up to 75% of dry weight, which can be converted into petrol, diesel or turbine fuel or other liquid or gaseous hydrocarbons. Recently, an experimental study was conducted on phycoremediation technology for wastewater using Botryococcus sp. The phycoremediation technology is useful to remove the excess of nutrients such as nitrogen, phosphorus and also have the ability to remove various pollutants from wastewater. This research implements the Verhulst model to estimate the nutrient removal by microalgae Botryococcus sp. from the wastewater. This model has been validated with the experiments of microalgae Botryococcus sp. grown in domestic and palm oil wastewater. The results suggested that microalgae Botryococcus sp. could be cultured in domestic and palm oil wastewater while nutrients are reduced from these wastewaters.

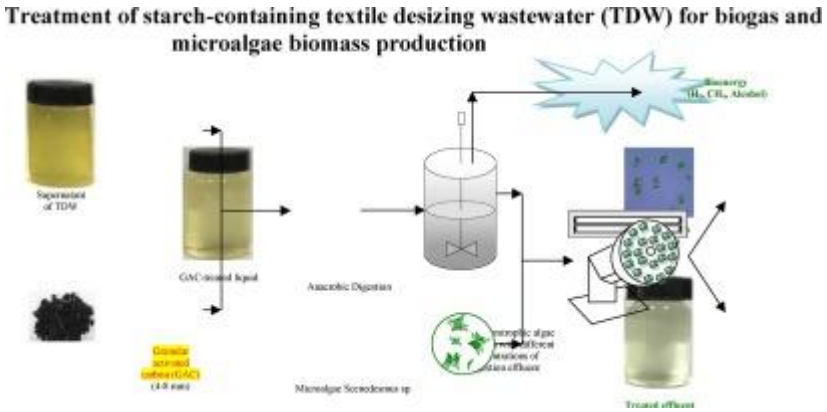
Starch-containing textile wastewater treatment for biogas and microalgae biomass production

Fecha de Publicación: Disponible Online 5 Septiembre 2017
Fuente: Journal of Cleaner Production
Autor(es): Chiu-Yue Lin, Mai-Linh Thi Nguyen, Chyi-How Lay
Enlace:
http://rss.sciencedirect.com/action/redirectFile?&zone=main&currentActivity=feed&usageType=outward&url=http%3A%2F%2Fwww.sciencedirect.com%2Fscience%3F_ob%3DGatewayURL%26_origin%3DIRSSSEARCH%26_method%3DcitationSearch%26_piikey%3DS0959652617320243%26_version%3D1%26md5%3D4ae9f679e78b45b98f03febb71af61da

Abstract

A starch-containing textile desizing wastewater (TDW) contains high strength organics that needed to be removed or reused. A novel process combining granular activated carbon (GAC) adsorption, mesophilic anaerobic digestion (AD) and microalgae Scenedesmus sp. cultivation was investigated using lab-scale reactors to treat a TDW for strength removal and producing biogas and algae biomass. TDW was pretreated by GAC to reduce AD-inhibitive matters and the digester effluent was further treated by the microalgae. This combination system achieved a total hydrogen, methane and ethanol energy production rate of 16.9 kJ/(L·d) and high removal efficiencies for color 92.4 %, chemical oxygen demand (COD) 89.5 %, carbohydrates 97.4 % and organic acids 94.7 %. At an AD effluent of 3.8 g COD/L, Scenedesmus sp. had high utilization efficiencies for acetate 95.2 %, propionate 97.1 % and butyrate 98.2 % with a specific growth rate of 0.53 d-1. Based on the experimental data, to treat a TDW in a flowrate of 1000 m3/d, productions of methane and dry microalgae biomass were predicted as 2.07 107 kJ/d and 9800 kg/7 d, respectively.

Graphical abstract



Arthrospira (Spirulina) in tannery wastewaters Part 1: The microbial ecology of tannery waste stabilisation ponds and the management of noxious odour emissions using microalgal capping

Fecha de Publicación: 2013
Fuente: Water SA
Autor(es): Dunn, K. and Rose, P.
Enlace:
https://syndic8.scopus.com/action/redirectFile?&zone=main&currentActivity=feed&usageType=outward&url=https%3A%2F%2Fwww.scopus.com%2Finward%2Frecord.uri%3Feid%3D2-s2.0-84878632032%26rel%3DR4.0.0%26partnerID%3D35%26md5%3Da95595202bf2ff9151458b0f61dbcd7e

Abstract

We investigated the problem of noxious gas and odour emissions in zero-discharge evaporative tannery waste stabilization ponds. These have been little-studied systems although they present one of few options for the management of tannery wastewaters in highly water-stressed areas. A three-year study of the microbial ecology of an evaporative waste stabilization ponding cascade was undertaken and a descriptive account of the biology and the physico-chemical parameters related to odiferous gas release is reported. Large populations of Arthrospira (Spirulina) dominated the latter facultative ponds in the cascade where odour emission was substantially reduced compared to initial anaerobic ponds. Photosynthetic productivity maxima of up to 9 000 mg·m-2·day-1 carbon fixation were measured in bloom conditions. Arthrospira production was associated with an oxygenated, alkaline layer established on the surface of facultative ponds (0.35 m in depth) in which oxidation of sulphide and ammonia, and the trapping of other odour-causing compounds was observed. An attempt was made to achieve comparable odour control in the anaerobic ponds by capping with recirculated microalgae-enriched effluent from facultative ponds. While this was shown to be effective in establishing an Arthrospira-dominant surface layer and an associated control of odour emissions in anaerobic ponds, large recirculation volumes (2:1) were required to maintain the Arthrospira population. Elevated salinity of recirculated facultative pond waters also negatively impacted the evaporative function in the low-salinity initial ponds in the cascade. An alternative method of Arthrospira capping was investigated which involved the construction of a free-standing high rate pond alongside the waste stabilisation pond system, and using a controlled feed of raw tannery effluent for optimising the cultivation of Arthrospira biomass. High biomass productivity was achieved in this unit (12.87 g·m-2·day-1), using a low feed to effluent loading volume ratio (0.21:1) and subsequent capping of anaerobic ponds from this source achieved odour control comparable to facultative ponds. This study has shown that management of the odour problem in waste stabilisation ponds is possible and that leather production using the zerodischarge evaporative disposal operation may be compatible with a level of both environmental and social acceptability of these systems. Odour problems, alone, should thus not constrain tanning as one of the few industrial agricultural activities available in rural economies.

Cultivation of oleaginous microalgae for removal of nutrients and heavy metals from biogas digestates

Fecha de Publicación: 2017
Fuente: Journal of Cleaner Production
Autor(es): Yang, S., Xu, J., Wang, Z.-M., Bao, L.-J., Zeng, E.Y.
Enlace:
https://syndic8.scopus.com/action/redirectFile?&zone=main&currentActivity=feed&usageType=outward&url=https%3A%2F%2Fwww.scopus.com%2Finward%2Frecord.uri%3Feid%3D2-s2.0-85027527371%26rel%3DR4.0.0%26partnerID%3D35%26md5%3Dbeea3bf732c47876fc308cd0991df752

Abstract

Cultivation of microalgae in anaerobically digested effluent is beneficial for removal of nutrients, such as nitrogen and phosphorus, and heavy metals at reduced cost and generation of biomass to produce biofuels. In the present study, four strains of oleaginous microalgae, separated from fresh water in South China, were evaluated for their ability to remove nitrogen and phosphorus. The results showed that Scenedesmus sp. (GN 171) was capable of removing nitrogen and phosphorous in BG-11 medium at the rates of 97% and 99%. Two types of anaerobically digested effluents, i.e., grass anaerobically digested effluent and molasses wastewater anaerobically digested effluent, were chosen as the nutrient sources.

These anaerobically digested effluents diluted in BG-11 medium or with tap water were used as the substitute medium to cultivate GN 171; other pretreatment methods, such as sterilization and dilution ratio, were also taken into consideration. A ratio of 1/3 for unsterilized grass anaerobically digested effluent/tap water mixture (designated as G4) was the optimal proportion for growth of GN 171 and removal of nitrogen and phosphorus at a large scale. The dry weight of GN 171 reached 3.2 g L-1 26 , and the total lipid, carbohydrate and protein contents were 34%, 30% and 16% in G4. The efficacies for removal of total nitrogen, ammonia nitrogen, phosphorus and selected heavy metals were generally satisfactory. It seems possible to use ADE, rather than any artificial medium, as the sole nutrient source for microalgae production.

A review of the potentials, challenges and current status of microalgae biomass applications in industrial wastewater treatment

Fecha de Publicación: Diciembre 2017
Fuente: Journal of Water Process Engineering, Volume 20
Autor(es): Ainil Farhan Mohd Udaiyappan, Hassimi Abu Hasan, Mohd Sobri Takriff, Siti Rozaimah Sheikh Abdullah

Enlace:
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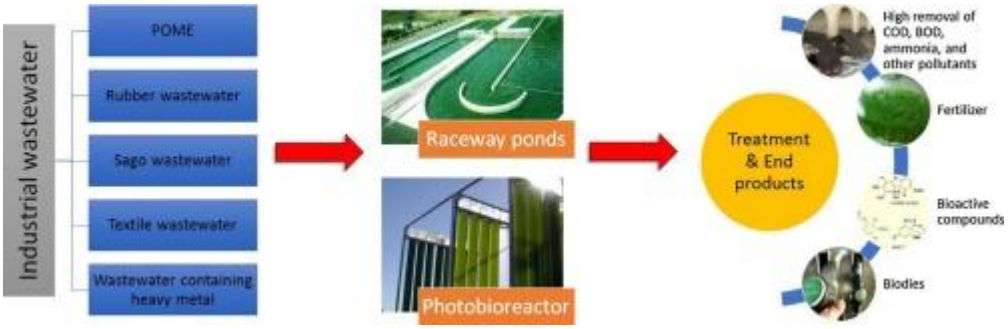
Abstract

Wastewaters from agro-industrial and industrial sources have significant organic matter contents, and some also contain oil and grease, heavy metals and toxic chemicals. Limits have been set for pollutants, especially wastewaters, entering water bodies. Conventional methods of treatment generally require large inputs of energy, large areas of land, and high operation and maintenance costs. Microalgae biomass offers an alternative treatment approach that removes nutrients and other pollutants, such as heavy metals, nitrogen compounds and harmful chemicals. Microalgae harvested after wastewater treatment can be used as value-added products because the microalgae is rich in carbohydrates, proteins and lipids. This paper presents the types of treatment processes, current application of microalgae and high-value products derived from microalgae used in wastewater treatment processes.

Graphical abstract



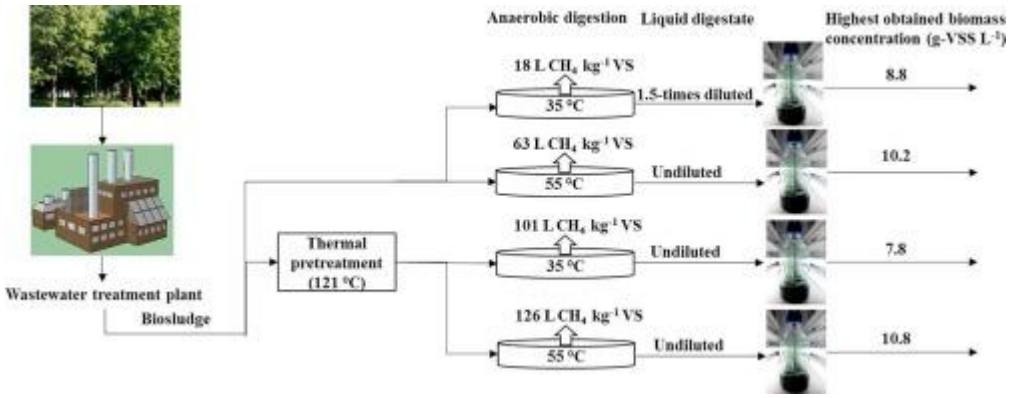
Cultivation of Scenedesmus acuminatus in different liquid digestates from anaerobic digestion of pulp and paper industry biosludge

Fecha de Publicación: Diciembre 2017
Fuente: Bioresource Technology, Volume 245, Part A
Autor(es): Ran Tao, Aino-Maija Lakaniemi, Jukka A. Rintala
Enlace:
http://rss.sciencedirect.com/action/redirectFile?&zone=main&currentActivity=feed&usageType=outward&url=http%3A%2F%2Fwww.sciencedirect.com%2Fscience%3F_ob%3DGatewayURL%26_origin%3DIRSSSEARCH%26_method%3DcitationSearch%26_piikey%3DS0960852417315328%26_version%3D1%26md5%3D49a279e73a0de0056df485ebbe82291d

Abstract

Different undiluted liquid digestates from mesophilic and thermophilic anaerobic digesters of pulp and paper industry biosludge with and without thermal pretreatment were characterized and utilized for cultivating Scenedesmus acuminatus. Higher S. acuminatus biomass yields were obtained in thermophilic digestates (without and with pretreatment prior to anaerobic digestion (AD): 10.2±2.2 and 10.8±1.2gL−1, respectively) than in pretreated mesophilic digestates (7.8±0.3gL−1), likely due to differences in concentration of sulfate, iron, and/or other minor nutrients. S. acuminatus removed over 97.4% of ammonium and 99.9% of phosphate and sulfate from the digestates. Color (74–80%) and soluble COD (29–39%) of the digestates were partially removed. Different AD processes resulted in different methane yields (18–126L CH4 kg−1 VS), digestate compositions, and microalgal yields. These findings emphasize the importance of optimizing each processing step in wood-based biorefineries and provide information for pulp and paper industry development for enhancing value generation.

Graphical abstract



PATENTES

Method of microalgae biomass flocculation

RU2603733C1

Fecha de Publicación: 27 Nov 2016
Aplicación: RU20150147505 (5 Nov 2015)
Aplicante:
FED GOSUDARSTVENNOE BJUDZHETNOE UCHREZHDENIE NATSIONALNYJ ISSLEDOVATELSKIJ TSENTR KURCHATOVSKIJ INST [RU]
Abstract:

FIELD: biotechnology.SUBSTANCE: invention relates to biotechnology and can be used in municipal (water treatment and wastewater) and agriculture, mining industry, medicine, biotechnological industry. Method of microalgae biomass flocculation from suspending medium is proposed. Method involves successive addition to suspending medium with biomass of microalgae coagulant six-water iron (III) chloride in concentration of 20-40 mg/l and flocculants: polyacrylamide and polyethylene oxide in amount, respectively, of 2-5 mg/l and 1-4 mg/l. Flocculation of biomass of microalgae is carried out, while stirring at temperature of 10-40 °C.EFFECT: invention provides increased rate of deposition of microalgae biomass.8 cl, 3 tbl

Dirección: http://www.patentinspiration.com/redirect?url=/patent/RU2603733C1

Microalgae culturing method and application thereof

CN106434353A

Fecha de Publicación: 22 Feb 2017
Aplicación: CN201611021477 (21 Nov 2016)
Aplicante: UNIV JIUJIANG
Abstract:

The invention provides a microalgae culturing method and application thereof. The microalgae culturing method is to remove cobalt ions and nitrogen and phosphorus in wastewater during the culture of microalgae. The microalgae culturing method of the invention includes inoculating the microalgae in the adherent culturing device, feeding the CO² gas, irradiating and feeding the wastewater containing the culture solution, wherein the wastewater is from the industrial waste water, and is rich in a large amount of metal ions such as cobalt and nitrogen and phosphorus. The microalgae cultured in the present invention can be used as raw materials for gasoline, diesel and aviation fuels. The microalgae culture method provided by the invention not only can remove the cobalt ions and nitrogen and phosphorus in the wastewater, but also the oil yield of the microalgae is improved at a certain high cobalt concentration. The invention provides a feasible new

technology for the removal of metal ions in wastewater and the industrialization of microalgae biofuels.

Dirección: http://www.patentinspiration.com/redirect?url=/patent/CN106434353A

Method for treating high ammonia-nitrogen wastewater through nutrition conversion of mixotroph

CN105712490A

Fecha de Publicación: 29 Jun 2016
Aplicación: CN2016191638 (19 Feb 2016)
Aplicante: UNIV NANCHANG
Abstract:
The invention discloses a method for treating high ammonia-nitrogen wastewater through nutrition conversion of mixotroph. The method for treating the high ammonia-nitrogen wastewater through nutrition conversion of the mixotroph comprises the following steps: 1, conducting transferring and culture on the mixotroph; 2, conducting high density culture in a culture medium rich in organic carbon or wastewater rich in organic carbon; 3, harvesting heterotrophic cells of the mixotroph; 4, transferring the heterotrophic cells into the high ammonia-nitrogen wastewater for autotrophic culture, absorbing high-concentration nitrogen and ammonia, and purifying the wastewater. According to the method, the method for changing the nutrition metabolism pathway of the mixotroph is introduced for treating the high ammonia-nitrogen wastewater, the treated wastewater can be recycled, the requirement of industrialized wastewater treatment conducted through microalgae is met, and the method is a new approach for conducting sewage treatment through produced microalgae economically and efficiently. The harvested microalgae cells can be further treated and used for preparing biological energy source, animal feed and the like.

Dirección: http://www.patentinspiration.com/redirect?url=/patent/CN105712490A

Applicants

Method for culturing microalgae on large scale by bean product wastewater

CN104357327A

Fecha de Publicación: 18 Feb 2015
Aplicación: CN20141373329 (31 Jul 2014)
Aplicante: PKU HKUST SHENZHEN HONGKONG ENVIRONMENTAL PROT ENGINEERING CO LTD
Abstract:
The invention discloses a method for culturing microalgae on a large scale by bean product wastewater. The method comprises the following steps: (1) performing amplified culture on microalga seeds; (2) preparing a bean product wastewater microalga culture medium; (3) inoculating the microalga seeds into the bean product wastewater microalga culture

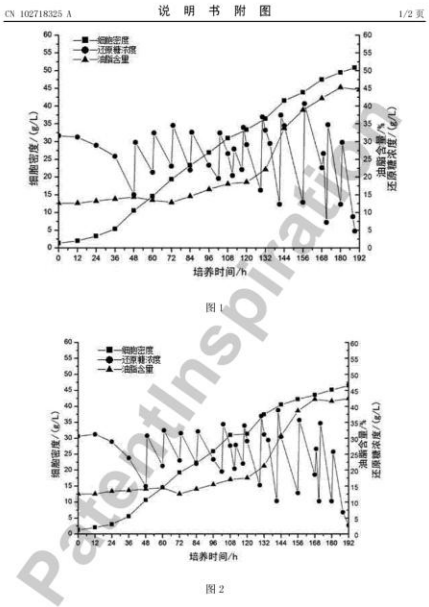
medium, and culturing the microalgae on a large scale; (4) performing heterotrophic culture for synthesizing and accumulating a large amount of grease in microalga cells; (5) separating and recovering the microalgae, and extracting microalga grease. According to the method, the energy microalgae are cultured by the bean product wastewater, so that a large amount of water resources and nutritional salt can be saved, the microalga culture cost can be greatly reduced, COD (chemical oxygen demand), TN (total nitrogen) and TP (total phosphorus) in the wastewater can be effectively removed, and the regeneration and emission-reduction dual-effect mode of the energy microalgae can be performed. Therefore, the method has relatively good industrialized application prospects.

Dirección: http://www.patentinspiration.com/redirect?url=/patent/CN104357327A

Method for culturing high-density oil microalgae to treat yeast industrial wastewater

CN102718325A

Fecha de Publicación: 10 Oct 2012
Aplicación: CN20121242303 (13 Jul 2012)
Aplicante: GUANGXI XIANGGUI SUGAR INDUSTRY GROUP CO LTD
UNIV TSINGHUA



Abstract:
The invention discloses a method for culturing high-density oil microalgae to treat yeast industrial wastewater. The method comprises the following steps of: carrying out clean pre-

treatment on wastewater obtained by producing yeast; then adding reducing sugar and nutritive salts to prepare a culture medium; sterilizing, inoculating and fermenting; and discontinuously feeding materials, and carrying out heterotrophism culture, so as to obtain energy microalgae with the cell density of 41.26-50.83g/L and the oil content of 40.86-45.26%. According to the method disclosed by the invention, a novel efficient and economical way which combines recycled utilization and energy-form production of industrial organic wastewater discharged in a yeast industrial production process is realized, so that the damages of the organic wastewater to the environment is reduced, and good economic benefits and social benefits are obtained.

Dirección: http://www.patentinspiration.com/redirect?url=/patent/CN102718325A

Noticias de interés general:

Astaxanthin Market Worth 814.1 Million USD by 2022
http://www.prnewswire.com/news-releases/astaxanthin-market-worth-8141-million-usd-by-2022-622074783.html

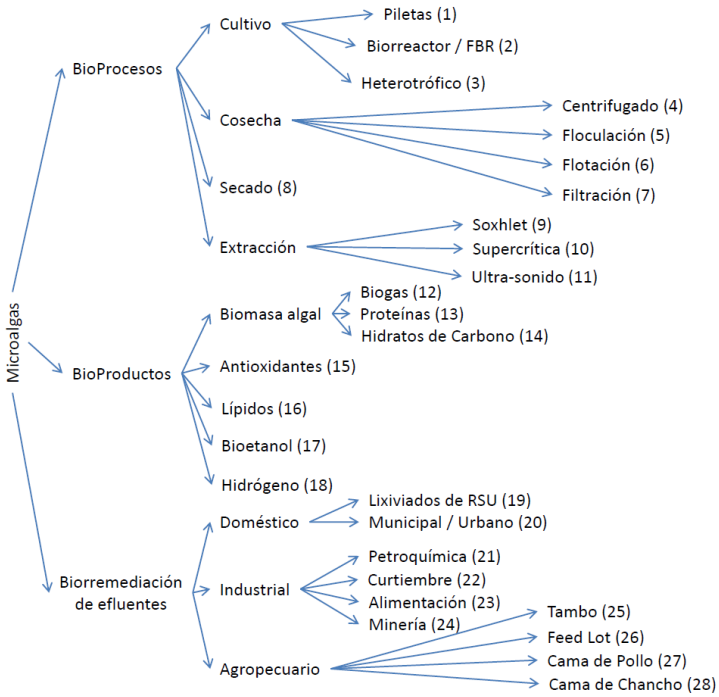
Eventos y Cursos

2017 Algae Biomass Summit
Salt Lake City, Utah, EEUU.
29 de octubre al 1 de noviembre de 2017

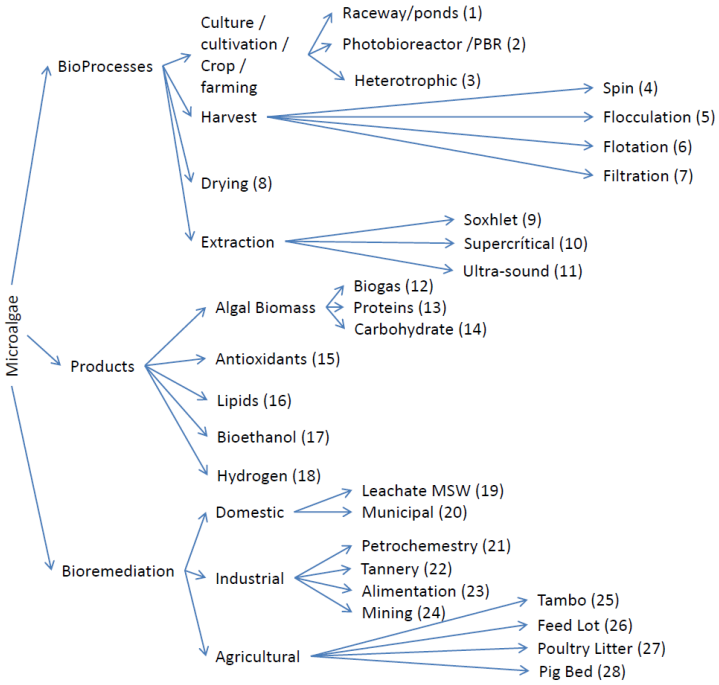
XI CONGRESO DE FICOLOGÍA DE LATINOAMÉRICA Y EL CARIBE y IX REUNIÓN IBEROAMERICANA DE FICOLOGÍA
Santiago de Cali, Colombia.
5 al 10 de noviembre de 2017

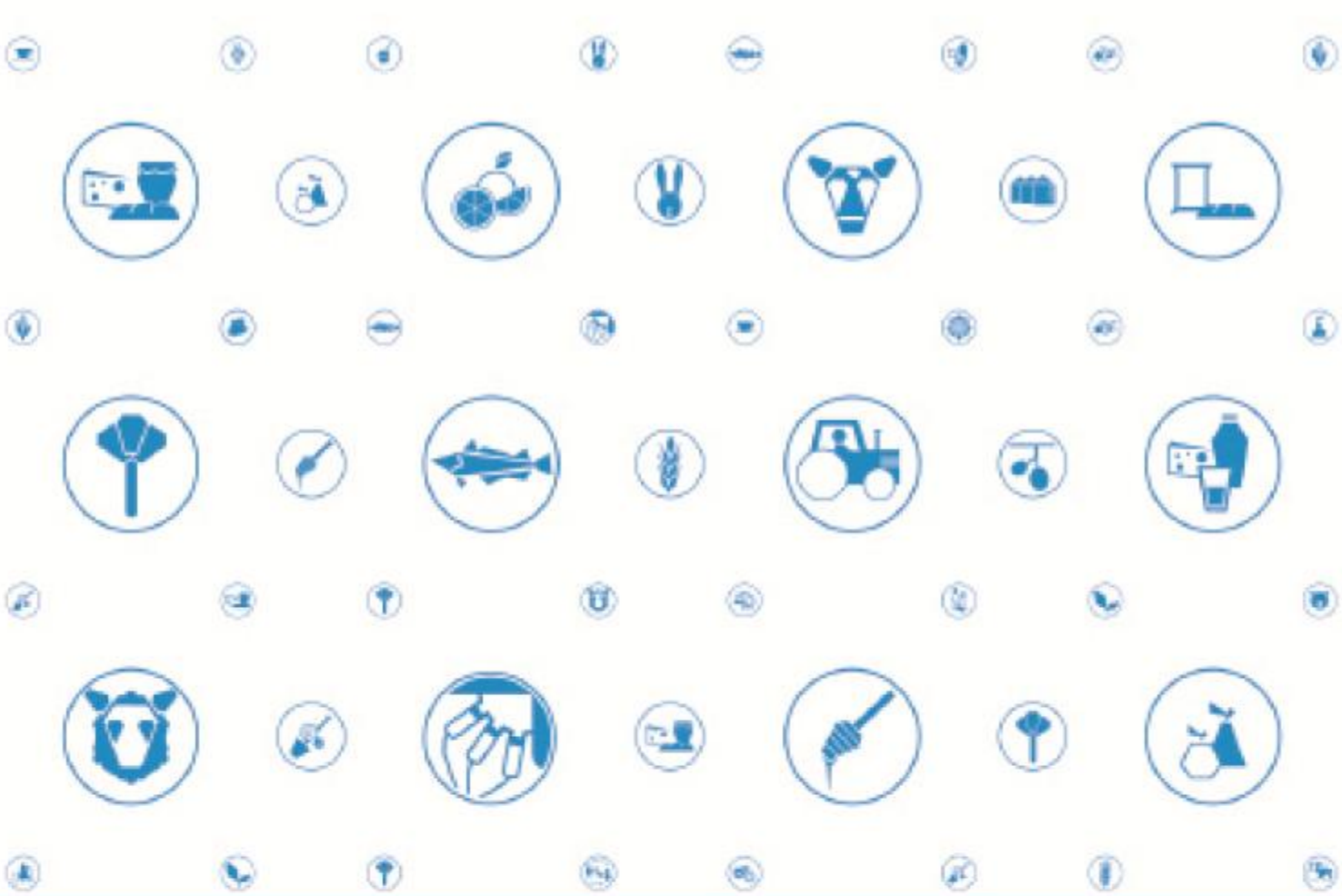
Árbol de categorías

Español



Inglés





TITULO

SUBTITULO