TIMES-DK: Technology-rich multi-sectoral optimisation model of the Danish energy system

As Denmark progresses towards a carbon neutral future, energy system models are required to address the challenges of the energy transition. This article describes design, input data and current usage of TIMES-DK, the first Danish energy system model that includes the complete national energy system, covering long-term technology investments. The article aims at explaining the modelling approach; highlighting strengths and reflecting upon limitations of the model; illustrating possible applications of TIMES-DK and inspiring new model developments. Some of the key strengths of the model include simultaneous optimisation of operation and investments across the complete energy system over the whole modelling horizon, explicit representation of the most important sectors of the economy, modular structure and the possibility of linking to a computable general equilibrium model for an additional insight on, e.g. public finance or CO₂-leakage. TIMES-DK is being developed in close collaboration between an energy agency, a university and a consulting firm, to improve its robustness, relevance and impact on policy making. It allows for a wide range of applications including exploratory energy scenarios and policy analysis. To meet challenges of the future, further development of the model is needed and consequently the article provides references to ongoing projects addressing current development needs, such as improved representation of transport and flexible handling of the temporal dimension. To support a democratic and transparent process around decisions for the future Danish energy system, TIMES-DK should become available to interested parties.
centers, thus causing power system failures. In this paper, the measurements within the phasor measurement units (PMUs) are used as attack and defense objects, and load shedding resulting from line failure is utilized to quantify the attack consequences. To construct the optimal defense against an FDIA, this paper examines the characteristics and construction of FDIAs from the perspective of attackers, aiming to reveal the shortcomings of traditional bad data identification. From the perspective of those defending against an FDIA, a two-layer defense model is proposed that includes detection and protection. First, information from multiple sources is utilized to improve the detection of false data. Second, extra PMUs are added as a protection method to strengthen the measurement redundancy. A zero-sum static game algorithm is applied to optimize the deployment of defense resources. The effectiveness of the proposed strategy is tested using IEEE 14-bus, 57-bus and 118-bus systems, and the impact of information asymmetry is also discussed.

General information
State: Published
Organisations: Department of Electrical Engineering, Center for Electric Power and Energy, Energy System Management, Southeast University, NARI Group Corporation (State Grid Electric Power Research Institute)
Contributors: Wang, Q., Tai, W., Tang, Y., Ni, M., You, S.
Pages: 169-177
Publication date: 1 Jan 2019
Peer-reviewed: Yes

Publication information
Volume: 104
ISSN (Print): 0142-0615
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): CiteScore 4.63 SJR 1.276 SNIP 1.662
Web of Science (2017): Impact factor 3.61
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 4.3 SJR 1.472 SNIP 1.843
Web of Science (2016): Impact factor 3.289
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 3.97 SJR 1.441 SNIP 2.031
Web of Science (2015): Impact factor 2.587
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 4.34 SJR 1.328 SNIP 2.312
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 4.54 SJR 1.231 SNIP 2.731
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 4.37 SJR 1.106 SNIP 2.758
Web of Science (2012): Impact factor 3.432
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 3.46 SJR 0.985 SNIP 2.394
Web of Science (2011): Impact factor 2.247
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.948 SNIP 2.258
Web of Science (2010): Impact factor 2.212
BFI (2009): BFI-level 1
Diluted Oxide Interfaces with Tunable Ground States

The metallic interface between two oxide insulators, such as LaAlO3/SrTiO3 (LAO/STO), provides new opportunities for electronics and spintronics. However, due to the presence of multiple orbital populations, tailoring the interfacial properties such as the ground state and metal-insulator transitions remains challenging. Here, we report an unforeseen tunability of the phase diagram of LAO/STO by alloying LAO with a ferromagnetic LaMnO3 insulator without forming lattice disorder and at the same time without changing the polarity of the system. By increasing the Mn-doping level, x, of LaAl1-xMnxO3/STO (0 ≤ x ≤ 1), the interface undergoes a Lifshitz transition at x = 0.225 across a critical carrier density of nc = 2.8×10^{13} cm^{-2}, where a peak TSC ≈ 255 mK of superconducting transition temperature is observed. Moreover, the LaAl1-xMnxO3 turns ferromagnetic at x ≥ 0.25. Remarkably, at x = 0.3, where the metallic interface is populated by only dxy electrons and just before it becomes insulating, we achieve reproducibly a same device with both signatures of superconductivity and clear anomalous Hall effect (7.6×10^{12} cm^{-2} < ns ≤ 1.1×10^{13} cm^{-2}). This provides a unique and effective way to tailor oxide interfaces for designing on-demand electronic and spintronic devices.
Multispectral photoacoustic sensing for accurate glucose monitoring using a supercontinuum laser

Accurate monitoring of glucose levels constitutes the most important parameter for diabetes management and treatment planning. In this work, we report on an in vitro glucose monitoring system based on multispectral photoacoustic sensing (MSPAS) using a cost-effective supercontinuum (SC) laser. We demonstrate for the first time, to the best of our knowledge, how the use of a broadband SC source allows the identification of distinct absorption characteristics of two major analytes (glucose and cholesterol) present in the human body in the extended near-infrared 1540–1840 nm spectral range. Employing the reported SC-based MSPAS system with a ratiometric analysis, we were able to accurately (coefficient of determination ≥0.938) measure a wide range of glucose concentration levels in vitro. We further demonstrate clinically accurate prediction of glucose concentrations over commonly encountered physiological levels inside the human body (0–400 mg/dL) with reference to a Clarke error grid analysis. These findings pave the way for devising potentially noninvasive and label-free continuous glucose monitoring systems.
Scaling power, bandwidth, and efficiency of mid-infrared supercontinuum source based on a GeO2-doped silica fiber

We demonstrate a supercontinuum source with a 20 dB bandwidth from ~1 to ~3 μm with output power exceeding 6 W based on a GeO2-doped silica fiber. This is the highest output power reported for a 3 μm supercontinuum source based on germania-doped silica fiber in an all-fiberized and compact size device. We further demonstrate a spectrum spanning from ~1.7 to ~3.4 μm (~10 dB bandwidth from ~1.8 to ~3.2 μm) at a low power of tens of milliwatts with more than 50% power fraction above 2400 nm, which makes this source suitable for several applications where a broadband source at low power is required to avoid damage of the samples. Our investigations reveal the unexploited potential of germania-doped fiber for mid-infrared supercontinuum generation and surpass the current state-of-the-art results.

General information
State: Published
Organisations: Department of Photonics Engineering, Fiber Sensors and Supercontinuum Generation, Nanyang Technological University, NKT Photonics A/S
Contributors: Jain, D., Sidharthan, R., Woyessa, G., Moselund, P. M., Bowen, P., Yoo, S., Bang, O.
Pages: A86-A92
Publication date: 2019
Peer-reviewed: Yes

Publication information
Journal: Journal of the Optical Society of America B
Volume: 36
Issue number: 2
ISSN (Print): 0740-3224
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 1.97 SJR 0.859 SNIP 0.875
Web of Science (2017): Impact factor 2.048
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.81 SJR 0.85 SNIP 0.936
Web of Science (2016): Impact factor 1.843
Web of Science (2016): Indexed yes
High-temperature oxidation of the Crofer 22H ferritic steel with Mn1.45Co1.45Fe0.1O4 and Mn1.5Co1.5O4 spinel coatings under thermal cycling conditions and its properties

The aim of the presented study was to deposit protective-conducting Mn1.45Co1.45Fe0.1O4 and Mn1.5Co1.5O4 spinel coatings on the Crofer 22 H ferritic steel by means of electrophoresis and to evaluate their physicochemical properties after high-temperature oxidation under thermal cycling conditions. When the Crofer 22 H steel – whether uncoated or coated with the two spinels – was oxidized in 48-h cycles involving a temperature of either 750 or 800 °C, its oxidation kinetics approximately obeyed the parabolic rate law. The oxidation rate observed for uncoated steel was higher than that for the studied coating/steel systems. The Fe-doped spinel coating material improved the oxidation resistance of steel to a higher degree than the undoped spinel coating. The obtained bulk spinels exhibited a regular phase composition and high electrical conductivity, while the Mn1.45Co1.45Fe0.1O4 and Mn1.5Co1.5O4 coatings were dual-phase, compact, and exhibited good adhesion to the metallic substrate. The area-specific resistance values measured for the steel/coating systems indicate that the coatings significantly improve the electrical properties of the studied ferritic steel, especially at 800 °C. The conducted research confirmed the suitability of the Mn1.45Co1.45Fe0.1O4 and Mn1.5Co1.5O4 spinels as coatings on the Crofer 22 H ferritic steel to be applied in the production of interconnects used in intermediate-temperature SOFCs.

General information
State: Published
Organisations: Department of Energy Conversion and Storage, AGH University of Science and Technology
Contributors: Bednarz, M., Molin, S., Bobruk, M., Stygar, M., Dlugorzeń, E., Sitarz, M., Brylewski, T.
Pages: 227-238
Publication date: 2019
Peer-reviewed: Yes

Publication information
Journal: Materials Chemistry and Physics
Volume: 225
ISSN (Print): 0254-0584
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 2.18 SJR 0.615 SNIP 0.833
Web of Science (2017): Impact factor 2.21
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.14 SJR 0.651 SNIP 0.918
Web of Science (2016): Impact factor 2.084
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 2.32 SJR 0.692 SNIP 0.989
Web of Science (2015): Impact factor 2.101
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 2.59 SJR 0.847 SNIP 1.281
Web of Science (2014): Impact factor 2.259
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 2.38 SJR 0.813 SNIP 1.254
Web of Science (2013): Impact factor 2.129
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 2.41 SJR 0.912 SNIP 1.434
Web of Science (2012): Impact factor 2.072
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Simulation of a SOFC/Battery powered vehicle

Solid oxide fuel cells (SOFCs) have received attention in the transport sector for use as auxiliary power units or range extenders, due to the high electrical efficiency and fuelling options using existing fuel infrastructure. The present work proposes an SOFC/battery powered vehicle using compressed natural gas (CNG), liquefied natural gas (LNG) or liquefied petroleum gas (LPG) as fuels. A model was developed integrating an SOFC into a modified Nissan Leaf Acenta electrical vehicle and considering standardized driving cycles. A 30 L fuel tank and 12 kW SOFC module was simulated, including a partial oxidation fuel reformer. The results show a significant increase of the driving range when combining the battery vehicle with an SOFC. Ranges of 264 km, 705 km and 823 km using respectively CNG, LNG and LPG compared to 170 km performed by the original vehicle were calculated. Furthermore, a thorough sensitivity analysis was carried out.

General information
State: Published
Organisations: Department of Energy Conversion and Storage, Functional Oxides, Electrochemistry, University of Oldenburg
Contributors: Bessékon, Y., Zielke, P., Wulff, A. C., Hagen, A.
Pages: 1905-1918
Publication date: 2019
Peer-reviewed: Yes

Publication information
Volume: 44
Issue number: 3
ISSN (Print): 0360-3199
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Experimental investigation and thermo-mechanical modelling for tool life evaluation of photopolymer additively manufactured mould inserts in different injection moulding conditions

There is a growing interest for integrating additive manufacturing (AM) technology in different manufacturing processes such as injection moulding (IM) due to the possibility of achieving shorter manufacturing times and increased cost effectiveness. This paper evaluates IM inserts fabricated by the AM vat photopolymerisation method. The inserts are directly manufactured with a photopolymer material, integrated on an injection moulding tool and subsequently used for IM. Therefore, particular attention has to be paid in order to develop the soft tooling process chain and the IM experimental procedure as detailed in this study. Different combinations of IM parameters are investigated in this work in order to determine the influence of the various process settings on the inserts’ performance (lifetime, crack propagation, consistency of the mould surface features). The mould inserts were analysed by three-dimensional optical metrology and evaluated with regard to the different surface features that were affected by the IM process. A three-dimensional thermo-mechanical with phase change model for the analysis of the effects of the IM process on the additive manufactured tools was accomplished in the FE software COMSOL Multiphysics. The potential causes for the insert failure are identified both by means of the IM experiments and the numerical model. The developed model could also predict the thermally induced deformations produced in the mould and identify where this phenomenon would eventually lead to defects in the shape of the parts. The influence of three different temperatures of the insert at 25 °C, 50 °C and 100 °C on the failure of the insert was investigated. Also a detailed discussion about the solidification and temperature changes is given.

General information
State: Accepted/In press
Organisations: Department of Mechanical Engineering, Manufacturing Engineering
Contributors: Davoudinejad, A., Bayat, M., Pedersen, D. B., Zhang, Y., Hattel, J. H., Tosello, G.
Publication date: 2019
Peer-reviewed: Yes

Publication information
Journal: International Journal of Advanced Manufacturing Technology
ISSN (Print): 1433-3015
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 2.8 SJR 0.994 SNIP 1.697
Web of Science (2017): Impact factor 2.601
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.3 SJR 1.046 SNIP 1.608
Web of Science (2016): Impact factor 2.209
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 1.8 SJR 0.889 SNIP 1.325
Web of Science (2015): Impact factor 1.568
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 2.03 SJR 1.082 SNIP 1.841
Web of Science (2014): Impact factor 1.458
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 2.26 SJR 1.134 SNIP 2.131
Web of Science (2013): Impact factor 1.779
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
Preparation of super-hydrophilic polyphenylsulfone nanofiber membranes for water treatments

Electrospun nanofiber membrane-supported thin film composite (TFC) membranes exhibit great potential in water purification. In this work, electrospun polyphenylsulfone (PPSU) nanofiber membranes were prepared and modified by heat and plasma treatments. The resulting membranes were used as support layers for biomimetic TFC-based forward osmosis membranes. Thermal treatment transformed a loose non-woven nanofiber structure into a robust interconnected 3-dimensional PPSU network displaying a 930% increase in elastic modulus, 853% increase in maximum stress, and two-fold increase in breaking strain. Superior hydrophilicity of PPSU nanofiber membranes was achieved by low-pressure plasma treatment, changing the contact angle from 137° to 0°. The fabricated exemplary TFC-based forward osmosis membrane showed an osmotic water flux $J_w > 14 \text{ L m}^{-2} \text{ h}^{-1}$ with a very low reserve salt flux $J_s / J_w = 0.08 \text{ g L}^{-1}$ demonstrating the potential for making high quality membranes for water treatment using PPSU-based support layers for TFC membranes.

General information

State: Published
Organisations: Water Technologies, Department of Environmental Engineering, Electrochemical Materials, Department of Energy Conversion and Storage, Electrochemical Materials and Interfaces, East China University of Science and Technology, Zhejiang University
Uncertainty in the prediction of the thermophysical behavior of new halogenated working fluids

Halogenated olefins can be an attractive alternative to working fluids that are under consideration for phase-out. In order to evaluate the potential of halogenated olefins as working fluids for organic Rankine cycle units with a realistic perspective it is necessary to predict both their primary thermophysical properties and their associated uncertainties. In this work we evaluated the uncertainty of two predictive models, based on the classical group contribution approach and on neural networks, for the critical temperature, critical pressure, acentric factor, and ideal gas heat capacity of halogenated substances. Based on this, guidelines for the most convenient model depending on the property and the fluid molecular structure were provided. The non-linear propagation of the uncertainty through the Peng-Robinson equation of state for the simulation of an organic Rankine cycle unit were also studied. The results suggest that the uncertainty of the predicted properties is highly dependent on the molecular structure for the classical model. The propagation of uncertainties in the simulation of an organic Rankine cycle unit also depends on the saturation properties of the fluid.
Pediatric Transthoracic Cardiac Vector Flow Imaging - A Preliminary Pictorial Study

Purpose
Conventional pediatric echocardiography is crucial for diagnosing congenital heart disease (CHD), but the technique is impaired by angle dependency. Vector flow imaging (VFI) is an angle-independent noninvasive ultrasound alternative for blood flow assessment and can assess complex flow patterns not visible on conventional Doppler ultrasound. Materials and Methods
12 healthy newborns and 3 infants with CHD were examined with transthoracic cardiac VFI using a conventional ultrasound scanner and a linear array. Results
VFI examinations revealed common cardiac flow patterns among the healthy newborns, and flow changes among the infants with CHD not previously reported with conventional echocardiography. Conclusion
For assessment of cardiac flow in the normal and diseased pediatric heart, VFI may provide additional information compared to conventional echocardiography and become a useful diagnostic tool.
The study analyzes approaches for the selection of working fluids for the design of heat pump cycles based on numerical modeling. Different approaches for defining economically reasonable assumptions for the heat exchanger dimensioning were compared with respect to the identification of thermodynamically and economically promising working fluids. It was revealed that comparisons based on fixed heat exchanger investment do not exploit the performance of potentially high performing fluids. The approach of defining the pinch point temperature differences in the heat exchangers was found to provide results that were closest to the economic optimum, while being readily applicable in screening procedures. The method was demonstrated by two examples using excess heat from data centers for district heating supply. For the two cases, zeotropic mixtures were identified that could improve the thermodynamic performance by 30%–35% while achieving a reduction of levelized cost of heat of 8% to 10%.

General information
State: Published
Organisations: Department of Mechanical Engineering, Thermal Energy
Contributors: Zühlsdorf, B., Jensen, J. K., Elmegaard, B.
Pages: 500-513
Publication date: 2019
Peer-reviewed: Yes

Publication information
Journal: International Journal of Refrigeration
Volume: 98
ISSN (Print): 0140-7007
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 3.46 SJR 1.471 SNIP 1.888
Web of Science (2017): Impact factor 3.233
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.06 SJR 1.371 SNIP 1.607
Web of Science (2016): Impact factor 2.779
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 2.44 SJR 1.349 SNIP 1.532
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 2.6 SJR 1.619 SNIP 2.086
Web of Science (2014): Impact factor 2.241
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 2.25 SJR 1.422 SNIP 1.944
Web of Science (2013): Impact factor 1.702
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 2.09 SJR 1.386 SNIP 1.893
Web of Science (2012): Impact factor 1.793
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 2.2 SJR 1.272 SNIP 2.129
Web of Science (2011): Impact factor 1.817
Design of segmented off-diagonal thermoelectric generators using topology optimization

A density-based topology optimization methodology is used to optimize the off-diagonal figure-of-merit and off-diagonal electrical power output of thermoelectric generators by distributing two different thermoelectric active materials in a two dimensional design space. Off-diagonal thermoelectric generators are characterized by converting a vertical thermal heat flux into a horizontal electric current, and may be useful in applications where the electrodes connected to the generator are prone to thermo-mechanical stress and wear. With basis in the topology optimization framework and a sequence of numerical examples, we discuss critical and important model parameters such as objective functions, heat transfer rates and device lengths. All results are supported by exhaustive crosschecks and validations, and it is shown that the off-diagonal figure-of-merit and the off-diagonal electrical power output may be improved by 233% and 229%, respectively, compared to other optimization approaches available in the literature.
Scopus rating (2017): CiteScore 8.44 SJR 3.162 SNIP 2.765
Web of Science (2017): Impact factor 7.9
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 7.78 SJR 3.011 SNIP 2.61
Web of Science (2016): Impact factor 7.182
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 6.4 SJR 2.635 SNIP 2.593
Web of Science (2015): Impact factor 5.746
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 6.93 SJR 3.158 SNIP 3.218
Web of Science (2014): Impact factor 5.613
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 6.59 SJR 3.06 SNIP 3.346
Web of Science (2013): Impact factor 5.261
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 5.69 SJR 2.778 SNIP 3.076
Web of Science (2012): Impact factor 4.781
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 5.5 SJR 2.416 SNIP 2.827
Web of Science (2011): Impact factor 5.106
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.531 SNIP 2.259
Web of Science (2010): Impact factor 3.915
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.992 SNIP 1.85
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 0.95 SNIP 1.206
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.168 SNIP 1.704
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 0.95 SNIP 1.277
Scopus rating (2005): SJR 1.02 SNIP 0.988
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 0.67 SNIP 0.844
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 0.713 SNIP 0.775
Scopus rating (2002): SJR 0.589 SNIP 0.779
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 0.368 SNIP 0.567
Scopus rating (2000): SJR 0.154 SNIP 0.498
Scopus rating (1999): SJR 0.181 SNIP 0.443
Switchgrass (Panicum virgatum) is a perennial grass highly valued as an energy crop resource for the production of bioethanol due to its high carbohydrate content, fast growth, and ability to grow in lands that cannot support crop or food production. In the present study, this biomass was submitted to steam explosion pretreatment in a semi-continuous pre-pilot reactor with the aim of obtaining a pretreated solid with high digestibility for enzymatic hydrolysis. Different conditions of temperature (170–200 °C) and residence time (5–15 min), leading to different severity factors (2.76–4.12) were used for steam explosion pretreatment, which were combined through a 2^2 central composite design. The results revealed that both variables had great influence in the process, affecting both the biomass structure and the saccharification yield, as a consequence. However, in the range of values evaluated in this study, the effect of the temperature was more prominent than the effect of the residence time. The best saccharification yield (88.3%) was obtained when using the biomass pretreated at 200 °C for 10 min. Similar result was obtained using a commercial cellulose pulp as feedstock for enzymatic hydrolysis, confirming that the best conditions for switchgrass pretreatment in the pre-pilot scale were successfully established.
Support-free nanostructured Pt Cu electrocatalyst for the oxygen reduction reaction prepared by alternating magnetron sputtering

Nanostructuring of electrocatalysts is an important aspect of catalyst design as catalytic performance depends not only on the specific activity (reaction rate per surface area), but also on the dispersion of the catalyst. We present an industrially compatible, but effective preparation method for support-free nanostructured catalyst layers. Alternating sputtering was used to prepare heterogeneous PtCu templates ranging from 95 up to 99.5at. % Cu. These templates were then electrochemically leached to form a nanostructured PtCu network and benchmarked with respect to the oxygen reduction reaction. It is shown that the templates with lower Cu:Pt ratios exhibit the highest initial specific activity but have a relatively low electrochemically active surface area. Subjecting the samples to extended accelerated stress tests, it is found that the support-free nanostructured PtCu networks are relatively resistant to high potential cycling, which can be explained by the lack of carbon corrosion. The loss in electrochemical surface area thereby depends on the initial Pt content. The specific oxygen reduction activity, however, approaches the value of bulk Pt. Although this decrease is not desirable, still an (specific) activity improvement of two to four times as compared carbon supported nanoparticles can be
Laccase activity measurement by FTIR spectral fingerprinting

Laccases (EC 1.10.3.2) are enzymes known for their ability to catalyze the oxidation of phenolic compounds using molecular oxygen as the final electron acceptor. Laccase activity is commonly determined by monitoring spectrophotometric changes (absorbance) of the product or substrate during the enzymatic reaction. Fourier Transform Infrared Spectroscopy (FTIR) is a fast and versatile technique where spectral evolution profiling, i.e. assessment of the spectral changes of both substrate and products during enzymatic conversion in real time, can be used to assess enzymatic activity when combined with multivariate data analysis. We employed FTIR to monitor enzymatic oxidation of monolignols (sinapyl, coniferyl and p-coumaryl alcohol), sinapic acid, and sinapic aldehyde by four different laccases: three fungal laccases from Trametes versicolor, Trametes villosa and Ganoderma lucidum, respectively, and one bacterial laccase from Meiothermus ruber. By coupling the FTIR measurements with Parallel Factor Analysis (PARAFAC) we established a quantitative assay for assessing laccase activity. By combining PARAFAC modelling with Principal Component Analysis we show the usefulness of this technology as a multivariate tool able to compare and distinguish different laccase reaction patterns. We also demonstrate how the FTIR approach can be used to create a reference system for laccase activity comparison based on a relatively low number of measurements. Such a reference system has potential to function as a high-throughput method for comparing reaction pattern similarities and differences between laccases and hereby identify new and interesting enzyme candidates in large sampling pools.
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 2.85 SJR 0.754 SNIP 0.944
Web of Science (2017): Impact factor 2.932
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.83 SJR 0.774 SNIP 1.028
Web of Science (2016): Impact factor 2.502
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 2.63 SJR 0.846 SNIP 0.95
Web of Science (2015): Impact factor 2.624
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 3.12 SJR 1.063 SNIP 1.212
Web of Science (2014): Impact factor 2.322
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 3.2 SJR 1.17 SNIP 1.377
Web of Science (2013): Impact factor 2.966
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 2.78 SJR 1.166 SNIP 1.27
Web of Science (2012): Impact factor 2.592
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): CiteScore 2.74 SJR 1.057 SNIP 1.262
Web of Science (2011): Impact factor 2.367
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.207 SNIP 1.559
Web of Science (2010): Impact factor 2.287
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 1.304 SNIP 1.504
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 1.214 SNIP 1.35
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 0.937 SNIP 1.259
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 0.908 SNIP 1.421
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 0.922 SNIP 1.436
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 0.857 SNIP 1.261
Scopus rating (2003): SJR 0.807 SNIP 1.208
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 0.878 SNIP 1.249
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 0.802 SNIP 1.188
Development of a high-resolution 3D geological model for landfill leachate risk assessment

Groundwater protection and risk assessment of contaminated sites (e.g. abandoned landfills, industrial waste facilities, gasoline stations, and dry cleaners) situated in complex glacial landscapes are extremely challenging. A common method to assess the risks for leakage and contamination of groundwater and surface water is to develop hydraulic models. However, reliable models need to contain information about both the three-dimensional (3D) distribution of the deposits and their hydraulic properties. Environmental risk assessments therefore require highly detailed digital 3D geological models. In order to construct models with this degree of detail, dense data coverage with high-quality data is necessary. Many studies rely on few data sources, resulting in relatively sparse data. In this study we demonstrate how 6 different data sources can be combined to gain new insight on the geological history, which is central to the subsequent 3D geological modelling. The analyses in this study include (i) geomorphology, (ii) spearg-lauger mapping and near-surface electromagnetic induction data, (iii) borehole analyses, (iv) geoelectrical profiling, and (v) transient electromagnetic measurements. The study area is located on the island of Samse in the central part of Denmark, where a digital 3D geological model is constructed. The model consists of combined layer and voxel models and covers a small area (~1 km²) surrounding a former landfill (Pillemark). The near-surface geology is characterized by a dead-ice landscape formed by glaciers during the Weichselian ice-age. By interpreting the new data it has been possible to update and revise the geological history, which was used during the development of a highly detailed 3D geological model. This model was constructed combining layers and voxels in order to better represent the complex geology and incorporate all the details provided by the different data sources. The novel geological understanding was used to update the risk assessment of the Pillemark landfill, where a remedial pumping today is ongoing. The immediate risk is related to the migration of landfill leachate downgradient through a lacustrine sandy aquifer and wetlands. Groundwater used for drinking water purposes is abstracted from an underlying sand and gravel aquifer (Tebbestrup formation), which is protected by a clay till (mid Danish till) found in the entire Pillemark area. A vertical hydraulic gradient from the upper to the lower aquifer indicates groundwater flow. However, the actual impact of landfill on the deeper aquifer has to be assessed by a detailed evaluation of the drainage system, pumping schemes and groundwater quality in the area. The 3D geological model is an important step toward the development of a groundwater flow model, required in order to establish a water balance for the hydrogeological system and estimate the vertical transport.

General information
State: Published
Organisations: Environmental Fate & Effect of Chemicals, Department of Environmental Engineering, Geological Survey of Denmark and Greenland, GEO, Aarhus University, Region of Central Denmark
Number of pages: 15
Pages: 45-59
Publication date: 2019
Peer-reviewed: Yes

Publication information
Journal: Engineering Geology
Volume: 249
ISSN (Print): 0013-7952
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 3.62 SJR 2.069 SNIP 2.169
Web of Science (2017): Impact factor 3.1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.35 SJR 1.869 SNIP 2.389
Hydrodynamics of the leucon sponge pump

Leuconoid sponges are filter-feeders with a complex system of branching inhalant and exhalant canals leading to and from the close-packed choanocyte chambers. Each of these choanocyte chambers holds many choanocytes that act as pumping units delivering the relatively high pressure rise needed to overcome the system pressure losses in canals and constrictions. Here, we test the hypothesis that, in order to deliver the high pressures observed, each choanocyte operates as a leaky, positive displacement-type pump owing to the interaction between its beating flagellar vane and the collar, open at the base for inflow but sealed above. The leaking backflow is caused by small gaps between the vaned flagellum and the collar. The choanocyte pumps act in parallel, each delivering the same high pressure, because low-pressure and high-pressure zones in the choanocyte chamber are separated by a seal (secondary reticulum). A simple analytical model is derived for the pump characteristic, and by imposing an estimated system characteristic we obtain the back-pressure characteristic that shows good agreement with available experimental data. Computational fluid dynamics is used to verify a simple model for the dependence of leak flow through gaps in a conceptual collar–vane–flagellum system and then applied to models of a choanocyte tailored to the parameters of the freshwater demosponge *Spongilla lacustris* to study its
flows in detail. It is found that both the impermeable glycocalyx mesh covering the upper part of the collar and the secondary reticulum are indispensable features for the choanocyte pump to deliver the observed high pressures. Finally, the mechanical pump power expended by the beating flagellum is compared with the useful (reversible) pumping power received by the water flow to arrive at a typical mechanical pump efficiency of about 70%.

**General information**

State: Published
Organisations: Fluid Mechanics, Coastal and Maritime Engineering, Department of Mechanical Engineering, University of Southern Denmark
Number of pages: 9
Publication date: 2019
Peer-reviewed: Yes

**Publication information**

Journal: Journal of the Royal Society. Interface
Volume: 16
Issue number: 150
Article number: 20180630
ISSN (Print): 1742-5689
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 3.89
Web of Science (2017): Impact factor 3.355
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.04
Web of Science (2016): Impact factor 3.579
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 3.5
Web of Science (2015): Impact factor 3.818
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 3.59
Web of Science (2014): Impact factor 3.917
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 4.88
Web of Science (2013): Impact factor 3.856
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 5.06
Web of Science (2012): Impact factor 4.907
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 4.53
Web of Science (2011): Impact factor 4.402
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Web of Science (2010): Impact factor 4.259
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Coherent control of selective bond breaking: HOD in the $\tilde{A}$-state revisited

The VUV photodissociation of HOD in the first ($\tilde{A}$-state) absorption band following a non-resonant impulsive vibrational excitation is studied theoretically. We show that a change in the linear temporal chirp of a VUV pulse with a fixed frequency distribution leads to control of the branching ratio $(H + OD)/(D + OH)$ between the two fragmentation channels.

General information
State: Published
Organisations: Department of Chemistry, Indian Institute of Science Education and Research, Kolkata
Contributors: Dey, D., Tiwari, A. K., Henriksen, N. E.
Number of pages: 3
Pages: 131-133
Publication date: 2019
Peer-reviewed: Yes

General information
State: Published
Organisations: Department of Chemical and Biochemical Engineering, CERE – Center for Energy Resources Engineering, KT Consortium, ProSim SA, ParisTech, Technical University of Denmark
Contributors: Wang, T., Guittard, P., Coquelet, C., El Ahmar, E., Baudouin, O., Kontogeorgis, G. M.
Pages: 126-127
Publication date: 2019
Peer-reviewed: Unknown

Publication information
Journal: Fluid Phase Equilibria
Volume: 485
ISSN (Print): 0378-3812
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): CiteScore 2.22 SJR 0.95 SNIP 1.033
Web of Science (2017): Impact factor 2.197
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.33 SJR 0.85 SNIP 1.187
Web of Science (2016): Impact factor 2.473
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 1.99 SJR 0.866 SNIP 0.998
Web of Science (2015): Impact factor 1.846
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 2.28 SJR 0.981 SNIP 1.232
Web of Science (2014): Impact factor 2.2
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 2.31 SJR 1.001 SNIP 1.277
Web of Science (2013): Impact factor 2.241
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 2.31 SJR 1.151 SNIP 1.279
Web of Science (2012): Impact factor 2.379
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): CiteScore 2.26 SJR 1.03 SNIP 1.235
Web of Science (2011): Impact factor 2.139
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 0.986 SNIP 1.308
Web of Science (2010): Impact factor 2.253
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 1.138 SNIP 1.153
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 1.229 SNIP 1.081
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.034 SNIP 1.153
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.022 SNIP 1.249
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 1.016 SNIP 1.289
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 0.984 SNIP 1.343
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 1.203 SNIP 1.294
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 0.64 SNIP 1.106
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 0.956 SNIP 1.287
Web of Science (2001): Indexed yes
Scopus rating (2000): SJR 0.994 SNIP 0.931
Web of Science (2000): Indexed yes
Scopus rating (1999): SJR 0.902 SNIP 0.887
Original language: English
DOIs:
10.1016/j.fluid.2018.12.010

Bibliographical note
Source: FindIt
Source-ID: 2442422467
Research output: Communication › Contribution to newspaper - Comment/debate – Annual report year: 2019