TSCFA台灣超臨界流體協會
Taiwan Supercritical Fluid Association

電子報第 188 期

活動訊息

- 第十屆理事、監事選舉作業結果公告
- 優良論文獎得獎名單

產業新聞

- 恭賀亞果生醫榮獲 IMAPAC2022 亞太地區生技製藥產業「最佳平台技術獎」!!!

Supergreen 2022 優良論文

- **OP-3-2**
  Synthesis of ZnO nanoparticles in sub- and supercritical water using a dual-stage flow reactor
  Makoto Akizuki*, Yongxu Wang, Yoshito Oshima
  (The University of Tokyo)
- **PP-08**
  Instant formulation of inhaled beclomethasone dipropionate-hydroxypropyl-beta-cyclodextrin composite particles produced using supercritical assisted atomization
  Hsien-Tsung Wu*, Yao-Hsiang Chuang, Tzu-Chieh Hu, Yu-Xuan Huang
  (Ming Chi University of Technology)

團體會員介紹

- 味丹生技股份有限公司

教育訓練班

- (夜間班)高壓氣體特定設備操作人員安全衛生教育訓練班 11/29~12/11

技術文摘

- Computational and Experimental Assessment of a MW-Scale Supercritical CO_2 Compressor Operating in Multiple Near-Critical Conditions 在多個近臨界條件下運行的 MW 級超臨界 CO_2 壓縮機的計算和實驗評估
- Impact of Supercritical CO_2 on Shale Reservoirs and Its Implication for CO_2 Sequestration 超臨界二氧化碳對頁岩儲層的影響及其對二氧化碳封存的意義
- Investigation of Gas Turbine Internal Cooling Using Supercritical CO_2—Effect of Surface Roughness and Channel Aspect Ratio 超臨界 CO_2 燃氣輪機內冷研究——表面粗糙度和通道縱橫比的影響

- Modeling and thermodynamic analysis of gas-supercritical carbon dioxide combined cycle system 氣體-超臨界二氧化碳聯合循環系統建模與熱力學分析
- Phytochemical profiling and biological activity of the extracts obtained from green biomass of three Miscanthus L. species - using supercritical carbon dioxide extraction 從三種芒屬植物的綠色生物質中獲得的提取物的植物化學分析和生物活性 - 使用超臨界二氧化碳萃取

台灣超臨界流體協會
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台灣超臨界流體協會　函

機關地址：811 高雄市楠梓區高楠公路 1001 號
聯 絡 人：吳家瑩 Gabi
聯絡電話：(07) 355-5706
傳　　真：(07) 355-7586
電子郵件：tscfa@mail.mirdc.org.tw

受文者：**全體會員代表**

發文日期：中華民國 111 年 11 月 01 日
發文字號：台超協字第 111009 號
速　　別：最速件
密　　等：普通
附　　件：如文

主旨：台灣超臨界流體協會第十屆理事、監事選舉作業結果公告。

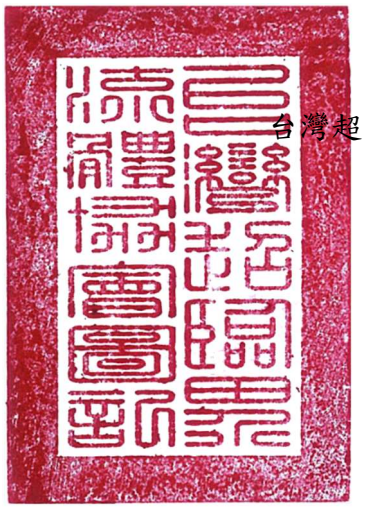
說明：

一、本會已於 111 年 10 月 28 日下午 2 時 30 分假集思北科大會議中心億光大樓 2 樓『感恩廳』舉行第十屆第一次會員大會暨理事、監事選舉，並在 4 時於監票人員監督下完成開票。會中選出第十屆新任理事 15 席(候補理事 5 席)，監事 5 席(候補監事 1 席)。

二、本會將於近期內舉行第十屆第一次理監事聯席會議，並依章程選出常務理事 5 席、常務監事 1 席、副理事長 1 席及理事長 1 席。

三、本會第十屆理監事當選名單詳如附件。

正本：本會全體會員



台灣超臨界流體協會『司選委員會』
主任委員 廖盛焜
委員 廖盛焜、孫傳家
梁明在、余榮彬
蘇至善、陳余芳

附件

台灣超臨界流體協會第十屆理事、監事選舉結果公告

【理事】

編號	理事	單位	職稱
01	梁明在	喬璞科技有限公司	總經理
02	蘇至善	國立台北科技大學化工系	教授
03	廖盛焜	逢甲大學纖維與複合材料系	教授
04	連培榮	金屬工業研究發展中心能源與精敏系統設備處	副處長
05	孫傳家	全研科技有限公司	處長
06	謝昌衛	中興大學食品暨應用生物科技學系	教授
07	余榮彬	財團法人安全衛生技術中心	總經理
08	吳弦聰	明志科技大學化學工程系	教授
09	王順仁	聯華氣體工業股份有限公司	經理
10	劉遨翔	台灣端板鋼鐵企業股份有限公司	經理
11	曾裕峰	台灣中油股份有限公司綠能科技研究所	副所長
12	陳余芳	品蔗國際貿易有限公司/品睿牙醫診所	總經理
13	吳守方	達諾生技股份有限公司	研發副總經理
14	黃松筠	興采實業股份有限公司	總經理
15	賴秉杉	國立中興大學化學系	教授
候補 01	葉樹開	國立台灣科技大學材料科學與工程系	教授
候補 02	張冠張	北京大學信息工程學院	教授
候補 03	楊顏福	中平有限公司	經理
候補 04	魏毅明	冷研科技有限公司	總經理
候補 05	王詩涵	國立雲林科技大學化學工程與材料工程系	副教授

【監事】

編號	姓名	單位	職稱
01	邱永和	台超萃取洗淨精機股份有限公司	協理
02	廖怡禎	愛之味股份有限公司	所長
03	馮瑞陽	高雄大學電機工程學系	副教授
04	李金樹	國防大學理工學院化學及材料工程學系	教授
05	翁堉翔	台灣中油股份有限公司綠能科技研究所	組長
候補 01	魏肇怡	亞果生醫股份有限公司	生產部副總

※依票數高低及姓氏筆劃排列

台灣超臨界流體協會
Taiwan Supercritical Fluid Association

Supergreen 2022 The 12th International Conference on Supercritical Fluids 暨第 21 屆超臨流體技術應用與發展研討會
優良論文得獎名單

◆ Best Oral Presentation Award

Paper #

OP-3-2 **Synthesis of ZnO nanoparticles in sub- and supercritical water using a dual-stage flow reactor**

Makoto Akizuki*, Yongxu Wang, Yoshito Oshima

(The University of Tokyo)

OP-4-1 **Supercritical carbon dioxide functionalization of polyethylene terephthalate (PET) for flexible biosensors**

Po-Wei Cheng*, Tomoyuki Kurioka, Chun-Yi Chen, Masato Sone, Tso-Fu Mark Chang

(Tokyo Institute of Technology)

OP-1-2 **Cocrystal screening of anticancer drug p-toluenesulfonamide and preparation by supercritical antisolvent process**

Chun-Jui Chien, Yu Tse Yen, Salal Hasan Khudaida, Chie Shaan Su*

(National Taipei University of Technology)

OP-1-3 **Excess molar enthalpies of the binary system carbon dioxide + ethyl lactate at 298.15 and 303.15 K and 5.0 – 7.0 MPa**

Hiroyuki Matsuda*, Tomoya Fukui, Kaito Kashioka, Yoshikatsu Furukawa, Kazuyuki Takizawa, Tatsuki Fujita, Kiyofumi Kurihara, Katsumi Tochigi

(Nihon University)

OP-2-3 **Supercritical carbon dioxide decellularized cartilage graft efficacy on post-traumatic osteoarthritis model**

Periasamy Srinivasan, Lien-Chen Wu, Chang-Jung Chiang, Dur-Zong Hsu, Yun-Ju Chen, Ming-Yao Chang, Dar-Jen Hsieh*

(ACRO Biomedical Co., Ltd)

◆ Best Poster Presentation Award

Paper#

PP-08 **Instant formulation of inhaled beclomethasone dipropionate-hydroxypropyl-beta-cyclodextrin composite particles produced using supercritical assisted atomization**
Hsien-Tsung Wu*, Yao-Hsiang Chuang, Tzu-Chieh Hu, Yu-Xuan Huang
(Ming Chi University of Technology)

PP-17 **Improvement of thermal conductivity of hybrid materials by organically surface modification of h-BN filler**
Haruka Onuma, Takaaki Tomai, Akira Yoko, Gimyeong Seong, Tadafumi Adschiri*
(Tohoku University)

PP-20 **One pot, simultaneous drying and micronization of ecamsule using supercritical CO_2 as an Antisolvent**
Aye Aye Myint, Jaehoon Kim*
(Sungkyunkwan University)

PP-03 **Prediction of drug solubility in supercritical carbon dioxide by PC-SAFT EOS**
Chen-Chen Wu, Yi-Ru Chen, Chieh-Ming Hsieh*
(National Central University)

PP-15 **Synthesis of metal oxide nanoparticles by supercritical hydrothermal methods with flow-type reactors and control of lattice distortion by nanosizing**
Nobutaka Chiba, Akira Yoko, Gimyeong Seong, Takaaki Tomai, Tadafumi Adschiri*
(Tohoku University)

◆ Special Award: The Hottest Paper Award

Paper#

OP-1-1 **Investigation of the solvation effect on decarboxylation in supercritical water using computational methods**
Anna Legaspi, Makoto Akizuki, Yoshito Oshima*
(The University of Tokyo)

PP-21 **Study on the optimization of subcritical water liquefaction of vinegar residues and acetic acid fermentation conditions for new vinegar products**
Daigo Murakami, Shoji Hirayama, Yuriko Hoshino, Kazuharu Yamato, Munehiro Hoshino, Mitsuru Sasaki*
(Kumamoto University)

恭賀亞果生醫榮獲 IMAPAC2022 亞太地區生技製藥產業

「最佳平台技術獎」!!!

Supergreen 2022 優良論文

OP-3-2

Synthesis of ZnO nanoparticles in sub- and supercritical water using a dual-stage flow reactor

Makoto Akizuki[a,*], Yongxu Wang[a], Yoshito Oshima[a]

[a]Department of Environment Systems, Graduate School of Frontier Sciences, The University of Tokyo,Kashiwa, Chiba, Japan

*Corresponding author: akizuki@k.u-tokyo.ac.jp

Continuous synthesis of metal oxide nanoparticles in sub- and supercritical water is a method to synthesize various kinds of nanoparticles with high productivity. In the synthesis, reaction conditions such as temperature, pressure, concentration of raw materials, and pH strongly affect size and morphology of synthesized nanoparticle because formation processes of particles such as nucleation and crystal growth strongly influenced by reaction conditions. By using a dual-stage reactor, since reaction conditions can be varied separately for the first and the second reactor, controllability of size and morphology will increase. In this study, we investigated how the reaction conditions of the second reactor affected size and shape (rod or sphere) of synthesized ZnO nanoparticles.

Experiments were conducted using a dual-stage flow reactor. (Fig. 1) The reaction condition in the first reactor was set to 400°C, 30 MPa, 0.050 s, and the reaction conditions in the second reactor were varied. Based on TEM observations, both rod and sphere particles were observed. When the reaction condition in the second reactor was 300°C, 30 MPa, and the concentration of $Zn(NO_3)_2$ and KOH in the second feed was 0 and 0.20 mol/L, respectively, the rod ratio by volume were 80-90% and almost unchanged regardless of residence time. (Fig. 2) On the other hand, the rod ratio by number increased with increasing time indicating that the size of each rod particle decreased with time. In the presentation, we will present detailed results including those of other reaction conditions.

This work was supported by the Hattori Hokokai Foundation and the JSPS KAKENHI (19K05132). Part of the analysis was performed using facilities at the Institute of Solid State Physics, The University of Tokyo.

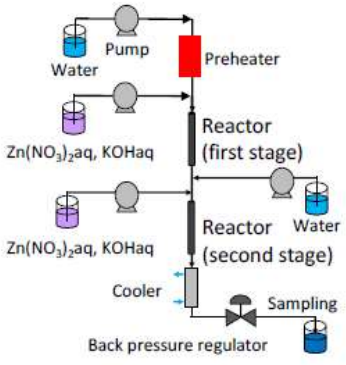


Fig. 1 Dual-stage flow reactor

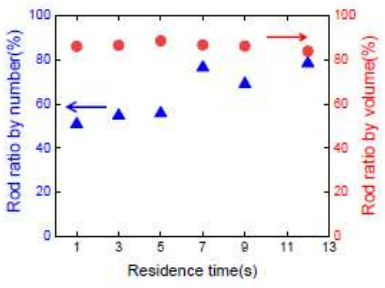


Fig. 2 Rod ratio of particles

PP-08

Instant formulation of inhaled beclomethasone dipropionate–hydroxypropyl-beta-cyclodextrin composite particles produced using supercritical assisted atomization

Hsien-Tsung Wu*, Yao-Hsiang Chuang, Tzu-Chieh Hu, Yu-Xuan Huang
Department of Chemical Engineering, Ming Chi University of Technology, New Taipei City, Taiwan
*Corresponding author: stwu@mail.mcut.edu.tw

The enhanced solubilization performance of a poorly soluble drug, beclomethasone dipropionate (BDP), was investigated using hydroxypropyl-β-cyclodextrin (HP-β-CD) and ethanol. The enhanced solubility of the drug was determined using the phase solubility method and correlated as a function of both HP-β-CD and ethanol concentrations. The effective progress of drug solubility originated from the formation of cyclodextrin and BDP inclusion complexes and increase in the lipophilicity of the medium for hydrophobic BDP. BDP and HP-β-CD composite particles were produced using supercritical assisted atomization (SAA) with carbon dioxide as the spraying medium, 54.2% (w/w) aqueous ethanol as the solvent, and an optimal amount of the dispersion enhancer leucine. The effect of the mass ratio of HP-β-CD to BDP (Z) on the in vitro aerosolization and in vitro dissolution performance of BDP–HP-β-CD composite particles was evaluated. The aerosolization performance showed that the fine particles fraction (*FPF*) of the composite particles increased with increasing mass ratio, and an *FPF* value of sample of a mass ratio of 35 could reach 55.2%. The water-soluble excipient (HP-β-CD) effectively enhance the dissolution rate of BDP from composite particles. This study suggests that BDP–HP-β-CD composite particles produced using SAA can be employed in the instant drug formulations for pulmonary delivery.

味丹生技
VEDAN BIOTECHNOLOGY

關於味丹生技

味丹生技創立於 2006 年，由味丹集團保健事業部合併位於彰化埤頭廠的東海綠藻工廠，正式成為全方位獨立事業體。

傳承味丹集團發酵的核心技術，以發酵微生物為主，開發綠藻、綠藻萃取物、藍藻、納豆激酶、γ-聚麩胺酸等機能性素材，頂尖發酵技術是我們的基石，讓我們的客戶遍布全球世界各地，包含歐洲、美洲、亞洲等，外銷超過 30 個以上的國家，僅僅綠藻粉的產量就可供全世界 76 億人口食用，我們用 Made in Taiwan 的世界級原料於國際上奠定根基。

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秉持著誠信嚴謹的態度，用專業的生物科技提供優質元素，帶給消費者健康生活。

天然 - 我們努力保留天然的成分，相信越單純對人體越是健康。

專業 - 我們用歷史經驗、功效實驗、研究精神換取今日的專業。

誠信 - 我們相信能為您帶來健康生活，誠信的核心價值是不變的初衷。

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TSCFA 台灣超臨界流體協會
Taiwan Supercritical Fluid Association

(夜間班)高壓氣體特定設備操作人員安全衛生教育訓練班

需要有操作證照的單位，歡迎向協會報名。

●上課日期：**(夜班)111/11/29~12/8 18:30~21:30；12/10~12/11 08:00~17:00(實習)**

●上課時數：高壓氣體特定設備操作人員安全衛生教育訓練課程時數 35 小時＋2 小時(測驗)。

●課程內容：高壓氣體概論 3HR、種類及構造 3HR、附屬裝置及附屬品 3HR、自動檢查與檢點維護 3HR、安全裝置及其使用 3HR、操作要領與異常處理 3HR、事故預防與處置 3HR、安全運轉實習 12HR、高壓氣體特定設備相關法規 2HR，共 35 小時。(另加學科測驗 1 小時及術科測驗約 1~2 小時)

●上課地點：高雄市楠梓區高楠公路 1001 號【金屬工業研究發展中心研發大樓 2 樓　產業人力發展組】

●參加對象：從事高壓氣體特定設備操作人員或主管人員。

●費　　用：本班研習費**新台幣 7,000 元整**，**本會會員享九折優惠**。

●名　　額：每班 30 名，額滿為止。

●結訓資格：期滿經測驗成績合格者，取得【高壓氣體特定設備操作人員安全衛生訓練】之證書。

●報名辦法：1.傳真報名：(07)355-7586台灣超臨界流體協會
2.報名信箱：tscfa@mail.mirdc.org.tw
3.研習費請電匯至 兆豐國際商銀 港都分行(代碼017)
戶名：社團法人台灣超臨界流體協會 帳號：002-09-018479（註明參加班別及服務單位）或以劃線支票抬頭寫「台灣超臨界流體協會」連同報名表掛號郵寄台灣超臨界流體協會，本會於收款後立即開收據寄回。

※洽詢電話：(07)355-5706 吳小姐繳交一吋相片一張及身份證正本

報　　名　　表

課程名稱	高壓氣體特定設備操作人員安全衛生教育訓練			上課日期	111 年 11/29~12/11	
姓　　名	出生年月日	身份證字號	手機號碼	畢業校名		公司產品
服務單位				電　　話		
服務地址	□□□			傳　　真		
發票住址	□□□			統一編號		
負 責 人	人	訓練聯絡人 / 職稱		email：		
參加費用	共　　元	參加性質		□公司指派　　□自行參加		
繳費方式	□郵政劃撥　□支票　□附送現金			報名日期	年　　月　　日	

※ 出生年月日、身份證字號、畢業校名、電話、地址須詳填，以利製作證書。〔！〕

上課日期時間表

課程名稱：(日間班)高壓氣體特定設備操作人員安全衛生教育訓練班

2022/11/29 (二)	18:30 ~ 21:30
2022/11/30 (三)	18:30 ~ 21:30
2022/12/01 (四)	18:30 ~ 21:30
2022/12/02 (五)	18:30 ~ 21:30
2022/12/05 (一)	18:30 ~ 21:30
2022/12/06 (二)	18:30 ~ 21:30
2022/12/07 (三)	18:30 ~ 21:30
2022/12/08 (四)	18:30 ~ 21:30
2022/12/10 (六)	08:00 ~ 17:00 (實習第 1 組)
2022/12/11 (日)	08:00 ~ 14:00 (實習第 1 組)

Computational and Experimental Assessment of a MW-Scale Supercritical CO_2 Compressor Operating in Multiple Near-Critical Conditions

在多個近臨界條件下運行 的 MW 級超臨界 CO_2 壓縮機的計算和實驗評估

By **Lorenzo Toni, Ernani Fulvio Bellobuono, Roberto Valente, Alessandro Romei, Paolo Gaetani, Giacomo Persico**

Centrifugal Compressor and Expanders NPD Baker Hughes, Nuovo Pignone, Via Felice Matteucci 2, Firenze 50127, Italy

Laboratory of Fluid Machines Energy Department, Politecnico di Milano, Via Lambruschini 4, Milano 20156, Italy

Abstract

This work illustrates the results of a wide experimental campaign in the frame of the EU-funded project sCO2-Flex, which focused on the investigation of a MW-scale sCO2 compressor operating in plant-representative conditions. The experimental tests were carried out for four temperature levels between 304.15 K and 309.15 K at a fixed pressure of 79.79 bar, hence covering an extended thermodynamic region close to the critical point. The experimental results are thoroughly discussed with the support of steady computational fluid-dynamics simulations, assuming homogeneous flows and thermodynamic equilibrium for the two-phase flow description. Changing the upstream total state, two peculiar variabilities in the compressor pressure ratio and choking flow rate are experimentally and computationally observed. While the former is mainly related to the single-phase flow thermodynamics, the latter originates from the onset of two-phase flows. As the simulations predict the experimental choking with a maximum error of 3%, the corresponding two-phase speed of sound is analyzed to infer the underlying equilibria between phases. It is found that, for the tested conditions, two-phase flows quickly achieve thermodynamic equilibrium, and non-equilibrium or metastable effects arguably play a marginal role in the process.

Keywords: CO_2, supercritical fluid, centrifugal compressor, experiments, barotropic, HEM, speed of sound

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Impact of Supercritical CO_2 on Shale Reservoirs and Its Implication for CO_2 Sequestration

超臨界二氧化碳對頁岩儲層的影響及其對二氧化碳封存的意義

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Abstract

Hydraulic fracturing has transformed the international energy landscape by becoming the go-to method for the exploitation of natural gas from unconventional shale reservoirs. However, in the recent years, the search for an alternative method of shale-gas exploration has intensified, because of various problems (e.g., contamination of ground and surface water, overexploitation of precious water resources, air pollution, etc.) associated with the usage of water-based fracturing techniques. The use of CO_2 for shale gas exploitation has emerged as a better alternative to aqueous-based gas exploration techniques. CO_2 when injected into deep shale reservoirs, transitions into supercritical CO_2 (SC-CO_2) when temperature and pressure condition exceeds the critical point, i.e., 31.1 °C and 7.38 MPa. In this paper, we comprehensively review the impact of SC-CO_2 on shale gas reservoirs during the different stages of shale-gas exploration, i.e., (i) drilling, which involves the superiority of SC-CO_2 over water-based drilling fluids, in terms of achieving under-balanced well condition, higher rates of penetration, and resistance to formation damage; (ii) fracturing, which involves factors affecting the tortuosity of fractures created by SC-CO_2 fracturing, breakdown pressure, and proppant-carrying capacity; and (iii) injection, which involves the twin-headed benefit of enhanced recovery due to CO_2/CH_4 competitive adsorption and geological sequestration, CO_2 vs CH_4 excess sorption as a function of pressure, etc. Several research works have indicated discrepancies on how SC-CO_2 impacts different shale properties. Some studies show low-pressure N_2-gas-adsorption-derived surface area and total pore volume to be increasing with SC-CO_2 imbibition, while others show a decreasing trend for the same. Similarly, for some shales, the quartz content, along with the clay mineral contents, decreased as the exposure to SC-CO_2 increased, while in some other studies, with similar long-term exposure to SC-CO_2, the quartz content was observed to increase along with the decrease in clay content and vice versa. Essentially, the increased exposure to SC-CO_2 results in the

dissolution of primary porous structures and fractures, and reformation of newer porous structure and conduits in shales. Nonetheless, these changes in the mineralogy weaken the microstructure of the rock bringing significant changes in the mechanical properties of the shales with implications on the wellbore stability and fracturing efficiency. The mechanical properties such as uniaxial compressive strength (UCS), Young's modulus, and tensile strength decrease as the SC-CO_2 saturation period increases. However, some studies have shown factors like bedding angle and phase-state of CO_2 having varying effect on the strength behavior of the shales. Moreover, changes in the structure of shales caused by the creation of fractures and the reduction of their strength can also pose major risks, because of potential leakage of CO_2 through these created pathways. How these processes would interact at field scale would control the sealing capacity, especially at field-scale for addressing long-term seepage of CO_2.

資料來源：Impact of Supercritical CO2 on Shale Reservoirs and Its Implication for CO2 Sequestration | Energy & Fuels (acs.org)

Investigation of Gas Turbine Internal Cooling Using Supercritical CO_2—Effect of Surface Roughness and Channel Aspect Ratio

超臨界 CO_2 燃氣輪機內冷研究——表面粗糙度和通道縱橫比的影響

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Abstract

In this paper, an experimental and numerical investigation of internal cooling channels with rib turbulators is presented with sCO_2 as the working fluid at process conditions (pressure-20.7 MPa and temperature up to 150 °C). The effect of channel aspect ratio up to 2:1 on thermal-hydraulic performance is explored in additively manufactured rectangular channels and square channels, both with and without 60 deg ribs on the top and bottom sides. The Wilson-plot method is employed to experimentally measure channel-averaged Nusselt number over a Reynolds number range up to 370,000. The friction factor is calculated from pressure drop and mass flow rate and additionally, the overall thermal performance factor (TPF) is reported. A companion computational fluid dynamics (CFD) simulation is performed for the rib turbulated cooling configurations reported in the experiments using the Reynolds average Navier–Stokes-based turbulence model. The objective of the numerical study is to gain insight into the local heat transfer augmentation in the ribbed channels as a result of varying the aspect ratio, channel configuration (square versus rectangular), operating conditions (Reynolds number) and the surface roughness, an inherent outcome of the additive manufacturing process. Surface roughness is simulated using sand grain roughness height (KS) calculated from the experimental data, and a comparison is presented with the corresponding channel configuration with varying surface roughness heights starting from smooth surfaces (KS = 0). Experimental results indicate that the heat transfer augmentation is negligible in the rectangular channels with ribs on the long side compared to the square channel. However, it is enhanced by 60% in comparison to placing ribs on the shorter side. The TPF remains constant at around 1 for the entire range of Reynolds numbers consistent with prior work at the National Energy Technology Laboratory (NETL). The simulation results highlight that increased surface roughness can have a favorable considerable influence on Nusselt number and overall thermal performance enhancement.

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Modeling and thermodynamic analysis of gas-supercritical carbon dioxide combined cycle system

氣體-超臨界二氧化碳聯合循環系統建模與熱力學分析

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Abstract

Gas turbine power generation has the advantages of flexibility, efficiency, and lower carbon emissions compared with coal-fired power generation. Under the situation of energy structure transformation and upgrading, gas turbine power generation will have bright prospects. In this paper, the modeling and thermodynamic analysis of various gas-supercritical carbon dioxide(sCO_2) combined cycle systems are carried out based on the calculation method of total physical properties, and six typical combined cycle layouts are selected for detailed research. In order to obtain the optimal state of the combined cycle system, the parameters of the sCO_2 bottom cycle are optimized within a certain range of the gas turbine pressure ratio. It is found that the combined cycle system has high thermal efficiency when the top cycle adopts the air preheating cycle, and a higher top cycle regenerative degree does not represent a better performance. In fact, the optimal regenerative degree is related to the bottom cycle performance. The study also found that the air preheating-dual heated cascade combined cycle system has the highest thermal efficiency of the layouts studied, reaching 65.3%, but it comes at the cost of a complex operating system. The heat recovery performance of the sCO_2 partial heating bottom cycle is relatively poor, and its mass flow rate is the highest, so it is not suitable for the bottom cycle of the combined cycle. The sCO_2 dual heated cascade cycle has the highest output work and the smallest CO_2 flow, so this paper considers this bottom cycle as the most suitable bottom cycle for the combined cycle system. This research can provide a certain basis for the design of gas turbine combined cycle system.

Keywords: Gas turbine, waste heat recovery, supercritical carbon dioxide cycle, thermodynamic analysis

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Phytochemical profiling and biological activity of the extracts obtained from green biomass of three Miscanthus L. species - using supercritical carbon dioxide extraction

從三種芒屬植物的綠色生物質中獲得的提取物的植物化學分析和生物活性 - 使用超臨界二氧化碳萃取

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Abstract

Taxa belonging to the genus Miscanthus L. (silvergrass) are non-invasive plants that can grow on marginal land that are not suitable for food production. These species give high yields of lignocellulosic biomass, being a rich and renewable source of organic matter for the production of second-generation biofuels (ethanol) and for other practical purposes, such as raw material for paper production. The most promising species of the genus Miscanthus L., in terms of practical use in industry and agriculture, are M. sinensis, M. sacchariflorum and their hydride - M. × giganteus. In this study, extracts obtained from the green biomass of these Miscanthus species underwent detailed phytochemical investigation and multidirectional biological evaluation. The extracts were prepared using supercritical fluid extraction with water as co-solvent. The qualitative RP-HPLC/PDA analysis of the extracts after their purification with solid-phase extraction confirmed their similar phytochemical profiles. Six free phenolic acids (p-hydroxybenzoic, isovanillic, syringic, p-coumaric, ferulic and isoferulic) and one trans-cinnamic acid derivative were identified and determined. The antimicrobial, antiviral, anthelmintic and anticancer activity of the supercritical extracts of Miscanthus L. species studied was revealed for the first time. Moreover, the extracts possessed low cytotoxicity against normal cells. This screening evaluation showed that, besides giving high yields of lignocellulosic biomass, these grasses could also be a source of valuable bioactive compounds for the pharmaceutical and cosmetic industries.

資料來源：https://pubag.nal.usda.gov/catalog/7931935