

通過液相萃取法回收鋰電池黑粉中的有價金屬

Recovering Valuable Metals from Lithium Battery Black Mass Through Liquid Extraction Method

隨著電動汽車越來越廣泛的應用，鋰電池的用量也迅速增加。而鋰電池的壽命一般在5~8年，報廢後的電池如果不經處理會造成嚴重的環境問題。另外，鋰電池中的鋰、鈷、鎳、錳等金屬也擁有實際的經濟效益以及戰略重要性，所以廢舊鋰電池的回收勢在必行。我們利用了有機酸以及液相萃取技術，高效低成本的從廢舊鋰電池中回收有價金屬。

As electric vehicles become more and more widely used, the use of lithium batteries is also increasing rapidly. The lifespan of lithium batteries is generally 5 to 8 years. If retired batteries are not processed, they will cause serious environmental problems. In addition, lithium, cobalt, nickel, manganese and other metals in lithium batteries also have actual economic benefits and strategic importance, so the recycling of used lithium batteries is imperative. We use organic acid and liquid phase extraction technology to recover valuable metals from used lithium batteries efficiently and at low cost.

有機酸浸出過程

Organic acid leaching process



萃取流程 Extraction process



效益

Benefits

- 減少鋰電池造成的環境污染
Reduce environmental pollution caused by lithium batteries
- 具有吸引人的經濟效益
Attractive economic benefits
- 選擇性回收鋰電池中的有價金屬
Selective recovery of valuable metals in lithium batteries
- 減少了對鋰礦進口的依賴
Reduced reliance on lithium ore imports

聯絡
Contact



資源循環技術研究中心- 綠色餐具及生物降解材料檢測及研發顧問服務

Circularity Research Centre - Green Tableware and Biodegradable Materials Testing and R&D Consultancy Service

資源循環技術研究中心(CRC)剛於今年四月成立，是一個現代化的檢測和研發設施，向公眾提供全面的檢測服務以及專業的研發顧問服務。該中心配備先進儀器，可提供綠色餐具材料鑒定服務以及生物降解性測試，亦能提供專業研發服務。

可提供的測試服務:

適用於【綠色餐具平台】登記的測試

- 傅裡葉變換紅外光譜 (FTIR) 材料分析測試
- 中國造紙協會防偽標準測試 (T/CPA 001 – 2021)

生物降解測試

Testing Standard

有氧堆肥生物降解測試	ISO 14855
土壤中有氧生物降解實驗	ISO 17556
有氧海洋生物降解實驗	ASTM D6691
厭氧生物降解實驗	ASTM D5511

研究中心亦為為香港和大灣區的中小企業提供量身定制的研發服務，重點開發用於可持續應用和應對氣候變化的新型綠色材料/技術。目前的研究領域包括：

1.先進的
儲能材料

2.生物
降解塑膠

3.電池
回收技術

Advance
Energy Storage
Materials

Enhanced
Biodegradability
Plastic

Battery
Recycling
Technologies

The Circular Research Centre (CRC) established April this year, is a modern testing and R&D facility that provides comprehensive testing services and professional R&D consultancy services to public. Equipped with advanced instruments, CRC offers key testing services on materials identification for green tableware and advanced biodegradability tests for single use plastics, as well as R&D on green materials and technologies.

Selected available testing services:

Testing applicable for [Green Tableware Platform] registration

- Fourier Transform Infrared Spectroscopy (FTIR) material analysis tests
- China Paper Association Repulpability Standard Test (T/CPA 001 - 2021)

Biodegradation Tests of Plastic Materials

Testing Standard

Aerobic Composting Biodegradation Test	ISO 14855
Aerobic Biodegradation Test in Soil	ISO 17556
Aerobic Marine Biodegradation Test	ASTM D6691
Anaerobic Biodegradation Test	ASTM D5511

The lab also provides tailored R&D services for SMEs in Hong Kong and the Greater Bay Area, focusing on developing novel green materials and technologies for sustainable applications and combating climate change. Current research area includes:

效益 Benefits

- 支援產品/行業符合政府監管要求
例子: 鑒定材料的主要成分，確保餐具符合本地綠色餐具平台的要求
To support the industry complies with the Government regulation requirements.
Example: Fulfilling no plastic requirement of the Green Tableware Platform by identifying the main composition of the materials.
- 支持“更綠色”材料/技術研發以及其商品化
To support the R&D of “Greener” materials/technologies to minimize their environmental impact, and their commercialization.

聯絡
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智能廚餘回收運輸機械人 Recycling Bin Transporter

智能廚餘回收運輸機械人是一套創新自動化系統，專為都市廚餘回收而設。機械人結合先進機械、人工智能及感應技術，可自動接近廚餘桶，利用雙鉤機構穩固夾持並傾斜搬運，將廚餘桶運送至指定處理區。其全方位移動底盤能在狹窄空間靈活操作，環境感應器則確保安全導航和即時避障。此專利發明展示出減少人力依賴、防止廚餘機滿桶溢出及提升運作效率的巨大潛力，助力智慧城市及可持續發展目標。

The Recycling Bin Transporter is an innovative robotic system designed to automate the collection and transportation of food waste bins in urban environments. The robot autonomously approaches food waste bins, securely latches onto them with a dual-hook mechanism, tilts and loads them onto its platform, and transports them to designated pre-treatment areas. The patented invention demonstrates significant potential to reduce labour dependency, prevent bin overflow, and enhance operational efficiency.

效益 Benefits

- 自動化廚餘桶收集，減省人手
Automates food waste bin collection, reducing manual labor
- 適合於狹窄空間高效運作
Operates efficiently in confined urban spaces
- 提升安全性及運作穩定性
Enhances safety and operational stability



聯絡
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空地一體化智慧巡檢系統

Smart Integrated Air-Ground Inspection System

污水處理廠屬於大型且複雜的設施，需定期巡檢以確保安全及符合法規的運作。然而，傳統人手巡檢不但耗時費力，亦可能令人員暴露於化學品、密閉空間及崎嶇地形等高風險環境。這些挑戰突顯出引入更智能、更安全及更高效巡檢方式的迫切需要。空地一體化智慧巡檢系統結合空中無人機與地面感測器，提供全場即時監察，有效提升安全水平、減少人員風險，並透過AI智能分析支援預防性維護。

Wastewater treatment plants are large, complex, and often hazardous environments that require frequent inspections to ensure safe and compliant operations. Traditional manual inspections are time-consuming, labor-intensive, and expose personnel to risks such as chemical exposure, confined spaces, and uneven terrain. These limitations highlight the need for smarter, safer, and more efficient inspection methods. The Smart Integrated Air-Ground Inspection System addresses these challenges by combining aerial drones and ground-based sensors to deliver real-time, site-wide monitoring. It enhances operational safety, reduces human risk, and supports proactive maintenance through AI-powered anomaly detection.



效益 Benefits

- 整合空中無人機與地面機械狗巡邏，實現全場域、實時監測。
Integrates aerial drones with robotic dogs for full-site, real-time monitoring.
- 自動識別漏液、設備故障等問題，預防事故發生。
Automatically identifies issues such as leakage and equipment faults to prevent incidents.
- 減少人員現場停留時間，實現遠程監控與操作。
Reduces the need for on-site presence, enabling remote monitoring and operation.
- 精簡巡檢流程，提升資源使用效率。
Streamlines inspection processes and improves resource utilization.
- 透過持續監控與智慧警報，支援安全穩定運作。
Supports safe and stable operations through continuous monitoring and intelligent alerts.

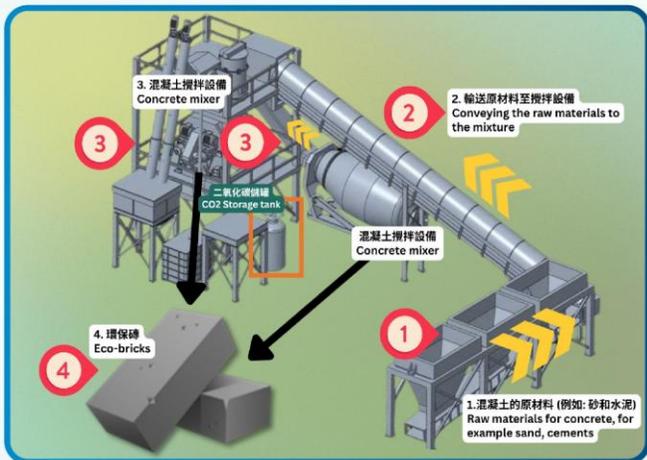
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利用環保磚儲存CO₂ CO₂ Storage via Eco-bricks

本專案旨在通過將二氧化碳存儲在混凝土中來生產環保磚，從而提供環境和結構上的雙重益處。我們從空氣中捕獲二氧化碳，進行淨化並將其整合到混凝土中，在那裡它會發生化學反應並增強材料強度。這減少了对傳統水泥的需求，顯著降低了與水泥生產相關的二氧化碳排放。每平方米的環保磚可以吸收約2公斤的二氧化碳。這個創新方法支援可持續建築，並與減緩氣候變化的努力相一致，為像香港這樣的城市地區提供了可擴展的解決方案。

This project aims to produce eco-bricks by storing CO₂ in concrete, offering environmental and structural benefits. We capture CO₂ from the air, purify it, and integrate it into concrete, where it chemically binds and strengthens the material. This reduces the need for traditional cement, significantly lowering CO₂ emissions associated with cement production. Each square meter of eco-bricks can absorb about 2 kg of CO₂. This innovative approach supports sustainable construction and aligns with climate change mitigation efforts, offering a scalable solution for urban areas like Hong Kong.



效益 Benefits

- 捕集並利用CO₂
Carbon dioxide capture and utilization
- 提高材料強度
Enhance mechanical performance
- 減少CO₂排放
Reduce carbon dioxide emissions
- 推動可持續建築
Promote sustainable construction



新型廚餘預處理系統 PTU2 - Food Waste Pretreatment Unit

廚餘回收新方向

這種新型的廚餘預處理系統將廚餘轉化為漿料，實現廚餘的高效運輸。系統所產生的漿料會暫時儲存在系統內，並由吸缸車收集，將收集頻率從每日收集減少至每週僅一次或兩次，從而降低運輸成本達 40-70%。

該系統結合機械粉碎與人工智能雜質排除技術，使其能夠同時實現高處理量和廚餘自動化分揀。

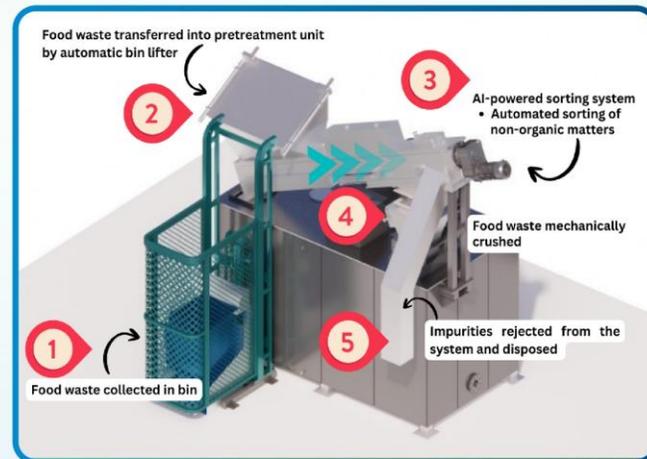
這革命性的方法不僅減輕了堆填區的負擔，還通過促進廚餘轉化為生物氣和堆肥等有機資源，為可持續循環經濟做出了貢獻。

The future of food waste recycling

The PTU2 is a new type of food waste pretreatment unit that converts food waste into slurry for efficient transportation. The slurry produced is stored onsite temporarily and collected by suction tankers, reducing collection frequency from daily to just once or twice a week, which cuts logistics costs by 40-70%.

The use of mechanical crushing combined with AI-powered impurities rejection enable the system to achieve high throughput and automated sorting at the same time.

This revolutionary approach not only alleviates the burden on landfills but also contributes to a sustainable circular economy by facilitating the conversion of food waste into valuable resources like biogas and compost.



效益 Benefits

- 高處理量
High throughput
- 基於電腦視覺的人工智能雜質辨識和排除系統
Vision-based AI impurities detection and rejection system
- 緊湊一體化設計
Compact and integrated design
- 低設備和安裝成本
Low capital and installation costs



產品碳足跡量化分析 通過可持續發展合規提升競爭力 Product Carbon Footprint Analysis: Enhancing Competitiveness through Sustainability Compliance

隨著對氣候變化的關注日益增加，可持續發展合規已成為企業的新要求。中國積極發展產品碳足跡管理體系，而歐盟則實施了碳邊境調整機制 (CBAM) 和可持續產品生態設計法規 (ESPR) 等法規，也包括數碼產品護照 (DPP)，這推動了供應鏈合規性的發展。生產力局提供符合ISO14067、GB/T24067、CBAM及其他標準的產品生命週期碳足跡 (LCA碳足跡) 評估與量化服務。我們提供具體減碳建議，助業界實現可持續發展合規、推動低碳轉型、建立綠色供應鏈，邁向碳中和目標。



As attention to climate change intensifies, sustainability compliance has become a new requirement for businesses. China is actively developing a product carbon footprint management system, while the European Union has implemented regulations such as the Carbon Border Adjustment Mechanism (CBAM) and the Ecodesign for Sustainable Products Regulation (ESPR), also including the Digital Product Passport (DPP), which collectively drive the evolution of supply chain compliance. HKPC provides product lifecycle carbon footprint (LCA for carbon footprint) assessment and quantification services that meet ISO 14067, GB/T 24067, CBAM, and other standards. We offer specific decarbonization recommendations to help industries achieve sustainability compliance, promote low-carbon transformation, establish green supply chains, and advance toward carbon neutrality goals.



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效益 Benefits

- 掌握碳足跡水平及識別生產過程中的排放熱點，以制定針對性的減排策略
Understand carbon footprint and identify production emission hotspots to formulate specific reduction strategies
- 符合CBAM機制及供應鏈等對碳管理的要求
Comply with CBAM mechanism and the requirements from supply chain, etc on carbon management
- 配合國家雙碳目標，作為碳管理「領跑者」，提升企業形象及同時增加產品附加價值
In line with national dual carbon goals, act as "Pioneer" in carbon management to enhance corporate image and at the same time enhance product value-added
- 向投資者、客戶、金融機構等持份者展示低碳轉型的努力
Showcase efforts in low-carbon transition to stakeholders such as investors, customers, and financial institutions.



聯絡 Contact

空氣感知實驗室 AirSense & Insights Laboratory



AirSense &
Insights
Laboratory

本實驗室為香港首個符合中國國家標準及英國標準，提供雙標準測試以滿足多元客戶需求—每月平均處理100+樣本，並由20+位通過校準的嗅辨員處理。

生產力局的 AirSense 及 Insights 實驗室提供符合英國/歐洲和中國標準的氣味測試服務，服務旨在幫助企業和設施識別和管理氣味問題，服務包括氣味巡邏、空氣和惡臭氣體採樣、氣味評估、氣味排放分析、氣味源頭追蹤，以及硫化氫、氨氣和總揮發性有機化合物測量。此外，實驗室提供氣味濃度、強度和喜惡度測量，以及其他有害氣體的化學成份分析。此服務有助減少堆填區、污水處理廠和垃圾收集站等設施引起的氣味問題，從而改善空氣質量，並達至相關規例要求。

Our laboratory is the first laboratory complied with both Chinese National Standards and British Standard methods in Hong Kong, offering dual-standard testing to meet diverse client needs—processing 100+ samples/month (average) with 20+ certified panellists.

HKPC's AirSense and Insights Laboratory offers odour testing services that comply with British/European and Chinese national standards. The odour assessment services provided by HKPC are designed to help the public identify and manage odour problems. Services include odour patrols, air and odour gas sampling, odour assessments, odour emission analysis, odour source tracing, hydrogen sulfide, ammonia and total volatile organic compounds measurements. In addition, the laboratory provides measurements of odour concentration, intensity and hedonic tone, as well as chemical composition analysis of harmful gases. These services help reduce odour problems caused by facilities such as landfills, sewage treatment plants and refuse collection points, thereby improving air quality and complying with relevant regulatory requirements.



氣味採樣技術

- 點源 – 環境空氣、煙囪
- 主動源頭 – 生物過濾器
- 被動源頭 – 污泥、垃圾、廢水
- 產品測試

Odour sampling techniques

- Point source – Ambient air, Stacks
- Active source – Biofilters
- Passive source – Sludge, garbage, wastewater
- Product testing

效益 Benefits

- 減少氣味對公眾造成的滋擾
Reduce odour nuisance caused to the public
- 幫助保障員工和公眾的健康和福祉
Help safeguard the health and well-being of employees and the public
- 改善空氣品質
Improve air quality
- 協助設施和工廠符合監管要求
Assist facilities and factories in complying with the regulatory requirements
- 節省與氣味管理相關的成本
Save costs associated with odour management



聯絡 Contact

流動式「清煙」化寶爐

流動式「清煙」化寶爐是一個通過電場以及水洗系統達到無黑煙化寶效果的系統。香港傳統燒香燭及焚燒祭祀用衣紙的習俗深植於文化之中，但同時亦帶來環境與健康方面的挑戰。焚燒衣紙會釋放有害污染物及產生黑煙，已成為居民及房屋機構日益關注的問題。雖然已有部分廟宇安裝了環保化寶爐，但不少市民仍然傾向在住宅區內焚燒金紙，因為更加方便。然而，現有的化寶爐系統通常體積較大、成本較高，這些因素可能令居民或樓宇管理方難以考慮安裝。

為了解決上述問題，本項目引入了小型「清煙」環保化寶系統，當中通過系統內的電場和水洗系統，達到減少污染的效果。此裝置專為高密度住宅區及公共空間而設計，具有體積小巧、可攜性高、操作簡易等特點，非常適合空間有限的地點使用。化寶爐的流動性大幅提升了部署的彈性，可在多個地點使用。

行業痛點

- 安全合規



圖一：小型環保化寶爐外觀



圖二：小型環保化寶爐高度
(圖中人員約170cm)



圖三：小型環保化寶爐使用的靜電除塵器

項目優點

- 以循序方式回應環境和健康層面的需求，從而提供全面性的效益
- 在環境方面，焚化爐能直接於源頭處理排放物，大幅減低懸浮粒子 (PM2.5 / PM10)
- 同時避免燃燒時產生黑煙，並有效避免在節慶期間灰燼四散的情況
- 在健康層面，密閉式設計可將煙霧洩漏降至最低，為易受影響的群組提供即時的呼吸防護

洽談業務合作

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香港生产力促进局是于1967年成立的香港法定机构，致力以世界级的应用研发、科技服务与综合制造服务推动香港企业提升生产力与竞争优势。作为以市场为导向的国际新型研发机构，香港生产力促进局凭借在人工智能、先进制造、生命健康、绿色科技及新能源等前沿领域的深厚实力和丰富产业经验，以创新科技引领新型工业化，推动新兴及未来产业发展。

香港生产力促进局以解决企业痛点和产业发展技术需求为核心，推动科技创新与产业创新深度融合，通过技术转移、产品创新、知识产权保护及研发成果商品化，强化与工商界及国际顶尖研发机构的协作，为产业创优增值，促进新质生产力发展。多年来，香港生产力促进局的卓越研发成果屡获本地、内地及海外奖项殊荣，持续助力香港成为国际创新科技中心及智慧城市。

为协助企业善用香港的国际化优势拓展全球市场，香港生产力促进局提供产品、技术、制造及管理关键需求的综合出海服务，助力企业通过香港成功出海。

香港生产力促进局也致力为中小企和初创企业提供实时和适切的支持，协助企业善用政府资助计划，并通过未来技能发展课程，提升企业及学界掌握最新数码及STEM技术，为香港培育具竞争力的未来人才。



香港生产力促进局成立“The Cradle 出海服务中心”，为香港及内地科创企业提供一站式专业支持，涵盖国际技术标准对接、产品本地化与国际化技术支持、知识产权管理及保护、海外法规等核心领域，助力企业成功



香港生产力促进局助力中小企应用人工智能(AI)，并提供系列技术方案及服务。局方自主研发的开放式AI平台“HKPC 天工开物”，提供一套端到端、可执行的AI转型支持体系，显著降低开发成本与技术门槛。

香港生产力促进局同时提供“AI治理与测试服务”及AI相关培训课程，助力企业应对安全顾虑挑战，提升企业对AI技术应用的理解与实践能力。

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1:3 1:3

BUD 品牌品牌、品牌推广及区内跨境零售的专项基金
Dedicated Fund on Branding, Upgrading and Domestic Sales

HK\$100万
1:3 1:3

EMF 中小企业市场推广基金
SME Export Marketing Fund

创新及研发

企业支持计划 (ESS) **HK\$1,000万**
1:1 1:1

智能生产

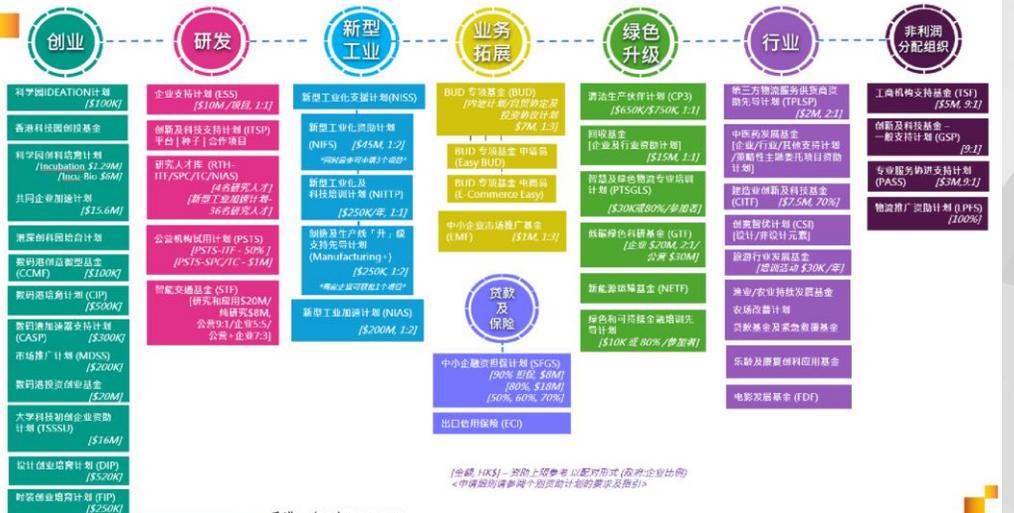
新型工业化资助计划 (NIFS) **HK\$4,500万**
1:2 1:2

新型工业加速计划 (NIAS) **HK\$2亿**
1:2 1:2

NEW

制造及生产线『升』级支持先导计划 (Manufacturing+) **HK\$25万**
1:2 1:2

资助比例 (政府:企业)



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