



The University of Hong Kong
Technology Transfer Office



VERSITECH LTD.

The University Technology Transfer Company

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THE ENERGY GAME CHANGER





SUCCESSFUL STORY

Using the Untapped Resource of Waste Heat

Waste heat is everywhere. You can't see it. But you can feel it. It's a known known. Following the law of thermodynamics, heat is discharged whenever an engine runs. What might surprise you is that over 70% of all the energy produced by human activities, natural systems, and all organisms is squandered as waste heat. This unavoidable by-product of doing work may have been an overlooked renewable for others, but in the eyes of Dr. Tony Shien-Ping Feng, Associate Professor of the Department of Mechanical Engineering at the University of Hong Kong and founder of [High Performance Solution Limited](#), it is a promising opportunity to hike up energy efficiency and cut carbon emissions.

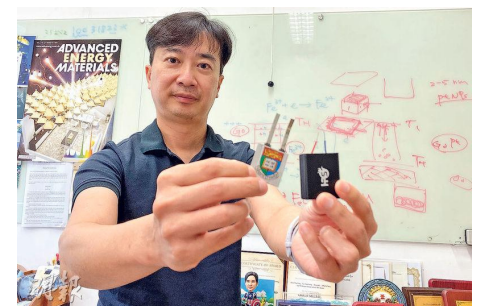
Unlike some of the already existing heat-to-electricity conversion technologies, the direct thermal charging cell (DTCC) can support direct charging by low-grade heat without the reliance on external electricity and generate electricity at an isothermal heating condition. To highlight its conversion efficiency (η_E), the DTCC attains a temperature coefficient of 5.0 mV K^{-1} and heat-to-electricity conversion efficiency of 2.8% at 70°C and 3.52% at 90°C . This thermo-battery comes with a simple system consisting of a basic unit of 1.5 sq.cm in size and 1 to 1.5 mm in thickness. The cell can be self-regenerated when cooled down at room

temperature. It is also pliable, stackable and economical. The high conversion efficiency and the assessable system of the DTCC offer a new avenue for smart and sustainable energy devices. Its major product development and practical application includes energy-saving air conditioners and smart windows. The team also sets their sights on exploring the delicate relationships between the DTCC and body heat, smart clothing with a motion tracker, wireless monitors as well as smart watches.

On the road to commercialisation, Dr. Feng admired the Technology Transfer Office (TTO) for their sheer dedication and unstinting support in setting High Performance Solution for success. The Office has helped the team to secure generous funding from the Technology Start-up Support Scheme for Universities (TSSSU@HKU), totalling approximately HKD1.725M for the past three years. It also assisted the company to enrol in the Incu-Tech Programme at the Hong Kong Science Park where they received their first revenue from the prototypes. In terms of intellectual property protection, TTO has filed a US provisional patent and a PCT (Patent Cooperation Treaty) patent for the invention. Dr. Feng is grateful for the opportunity to launch, sustain, and scale a venture which helps solve real-world problems. High Performance Solution raised nearly HKD5M funding for further

development, generated about HKD2M in revenue this year, and held three other pending patents for its disruptive technology. Besides receiving the commercial success, Dr. Feng's research and the invention was published in Nature Communications, one of the highly regarded peer-reviewed journals in the field. The article, entitled "Direct thermal charging cell for converting low-grade heat to electricity" can be retrieved [here](#).

While the global demand for energy is booming and global warming is reaching its boiling point, Dr. Feng is aware that there is no silver bullet that can prevent the phenomena entirely. However, he envisages that the invention will pan out and save these invisible yet precious drops of waste heat to usable energy in the near future.



Dr. Feng was showing us how low-grade waste heat could be a source of alternative energy.

PHOTO COURTESY OF MING PAO

RECENT HIGHLIGHTS

Technology Transfer Primer has continued the momentum on exploring technology transfer issues with the research community at HKU. On 3 December 2020, Ms. Eliza Kung painted a nuanced picture of legal documents essential for industry collaboration and relevant legal issues in this day and age. On 10 December 2020, Mr. James Wong shared with us how start-ups could shore up financing from the vantage point of experience. On 17 December 2020, three TSSSU awardees, Dr. Llewellyn Tang, Dr. Zhong Shen and Dr. Ting Wang, were invited to talk us through their entrepreneurial journeys, emerging technologies and specific milestones they have set. We welcome all of you to join us at a webinar series of "Technology Commercialization – Grab the opportunities in Greater Bay Area" to learn more about transforming cross-border challenges to opportunities.



Besides periodic events that serve as a living repository, news about our spin-offs can add a layer of intrigue and inspire innovations. In November 2020, Lifespans, Fano Labs and Hactis were featured in local media about their game-changing technologies. In particular, our TSSSU-awarded spin-off, Momentus Robotics Limited, was reported on its patented MR-safe robotic actuation. Last but not least, an interchange of ideas can shine a bright light on how we nurture start-ups to fruition. On 15 December 2020, TTO had a meeting with the OHKF to discuss how we could join hands to develop an innovation hub of the future.

Patents at a Glance

Consistent with our strategic goals, TTO progressed to protect HKU's intellectual property in a timely fashion. 11 patents were filed cumulatively from 30 November 2020 to 14 December 2020 and recapitulated as follows:

IP00778 Prof. Kwok Yung Yuen; Microbiology (US Regular filed on 30 Nov 2020); Mature Airway Organoids, Methods of Making and Uses Thereof

IP00760 Prof. Chi Ming Che; Chemistry (US Regular filed on 1 Dec 2020); Tungsten(VI) Compounds with Thermally Activated Delayed Fluorescence or Phosphorescence for Organic Light-Emitting Devices

IP00888 Prof. Chiu Yat Patrick Woo; Microbiology (US Regular filed on 1 Dec 2020); Prevention and Treatment of Ocular Infection, Composition and Methods Thereof

IP00998 Dr. Wai Tung Wilton Fok; EEE (US Provisional filed on 2 Dec 2020) ; Swimmer Performance Analysis System

IP00769 Prof. Jian Wang; Physics (CN application filed on 3 Dec 2020); Metal-Oxide-Semiconductor Field-Effect Transistor With a Cold Source

IP00837 Dr. David Wai Chan; Obstetrics and Gynaecology (CN application filed on 4 Dec 2020); 苦瓜蛋白MAP30在製備預防和治療卵巢癌的藥物或化療補充劑中的用途

IP00916 Prof. Yiu Cheong Leung; ME (US Provisional filed on 7 Dec 2020); Flexible and Printable Paper-Based Al Ion Batteries

IP00976 Prof. Mingxin Huang; Mechanical Engineering (CN application filed on 8 Dec 2020); 一种利用快速凝固过程制备抗菌不锈钢的方法及其应用

ZIRI00013 Prof. Lixi Huang; ME (CN application filed on 8 Dec 2020); 一种智能可调隔声器密封式抽油煙機消聲器設計

IP00953 Prof. Kwok Yung Yuen; Microbiology (2nd US provisional filed 10 Dec 2020); The First Generation of Synthetic Vaccine against Staphylococcus Aureus Infection

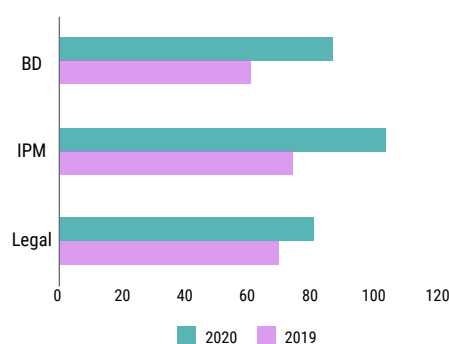
IP00851 Prof. Ka-Li Frankie Leung; Orthopaedics and Traumatology (PCT filed on 11 Dec 2020); Motor-Driven Fixator to Apply Micromotion to Fracture Site to Accelerate Bone Healing

Remarkable Efforts

Total engagements and handling cases by our three service arms – the business development (BD), intellectual property management (IPM) and the legal team – climbed by 32.7% in November 2020, a year-on-year spurt that demonstrated TTO's phenomenal experience in dealing with a deluge of economic, social and health crises that have unfolded at top speed.

The technology commercialisation and industry engagement, entrepreneurship and incubation support as well as marketing outreaches by the BD team posted the third straight month of lofty growth in November 2020, up by 42.6%, bringing a total of 87 from a year earlier. The number of cases handled by the IPM team in regard to IDFs, office action matters, evaluation reports, USP/PCT/national application filings and more surged to settle up 40.5% at a new high of 104. Our legal team also achieved a 15.7% boost in case management in November from 70 to 81 from a year earlier and will continue to shower the intrepid researchers at HKU with unanimous, unconditional and unequivocal support.

Total Engagements and Handling Cases




About TTO


The Technology Transfer Office (TTO) is committed to maximising the impact of research through technology transfer at both the institutional and industrial levels. TTO works closely with researchers at HKU to commercialise their inventions through professional consultation on business development, legal advice and assistance, as well as patent application filings. Your inventions would not benefit the society until they are mass produced. Contact us for such a transformation.

About Versitech


Versitech Limited is the commercial arm of HKU. Versitech negotiates, executes and manages commercial business contracts and agreements on behalf of the University.

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ACT NOW!

Transferring Your New Technologies into Business Opportunities

Policy Stipulation

The latest policy stipulates that the net receipts arising from the exploitation of an Invention are shared among the University, the relevant faculty/department and the inventor(s) in the ratio of 1/3 : 1/3 : 1/3. It aims to encourage the researchers at HKU not only to excel in academic performance but also to apply their technology for the benefits of mankind with an impressive reward.

Share Your Success Story

Do you have a success story you want to share with colleagues and experts in the field? We have made it easy to do, and your story will appear on our issue. Your success story can inspire greatness. Don't hesitate to send us your story at emily@tto.hku.hk.



How to Apply: 4 Phases for Research Projects

Phase 1: Initial project negotiation

1. PI will negotiate with their collaborator(s) and confirm a project proposal which includes the scope, budget and duration of the project.
2. PI will negotiate with their collaborator(s) and prepare a draft agreement (Agreement templates are available at the website of the Research Services (RS): <http://www.rss.hku.hk/contracts/contractresearch/templates.>)

Phase 2: Endorsement from department/faculty

3. PI will submit the project proposal, the draft agreement, and the information form/grant application form to their department/faculty to seek an approval (The information form for research/consultancy agreements is available at: <http://intraweb.hku.hk/local/rss/tto/researchor-consultancy-agreements-form.doc>).
4. After obtaining the approval, PI will submit the project proposal, the draft agreement, and the information form/grant application form to the Research Service (RS).

Phase 3: Financial legal/IP review

5. The RS will distribute the project proposal and the draft agreement to the Finance and Enterprises Office (FEO) for financial review and to the Technology Transfer Office (TTO) for legal review.
6. If there is any financial/legal issue, the FEO/TTO will inform PI through the RS. PI will negotiate with their collaborator(s) on the financial/legal issue until it is settled.

Phase 4: Signature and document archiving

7. After consolidating the settled project proposal and the agreement, the RS will proceed to the signature process.
8. After duly performing the signature process, the RS will assign the RCGAS number(s) for opening the project account(s) and archiving all the documents.

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