



The University of Hong Kong  
Technology Transfer Office

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<https://www.tto.hku.hk>

# THE ROAD AHEAD: STEEL REVOLUTION & THE RESHAPING







## SUCCESSFUL STORY

### *The Super Steel Outclasses Its Challengers*

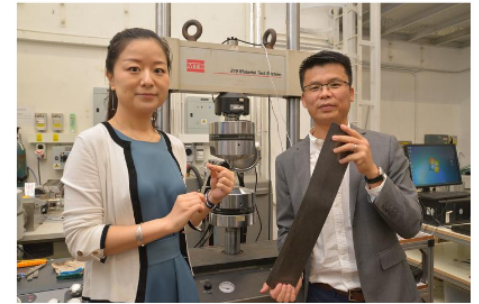
Long before the breakthrough of the Super Steel project, led by Professor Huang Mingxin at the Department of Mechanical Engineering of the University of Hong Kong (HKU), with collaborators at the Lawrence Berkeley National Lab (LBNL), an increase in strength is believed to come with some brutal yet unavoidable trade-offs: either the metal becomes more brittle (the strength-toughness trade-off), or be less flexible to be extended or elongated into different shapes (strength-ductility trade-off). The birth of the Super Steel, achieving the unprecedented yield strength of 2.2 GPa and uniform elongation of 16%, yet challenges the practically impractical.

This new generation steel material has an exclusive fracture feature in which multiple micro-cracks are formed below the main fracture surface through a novel toughening mechanism called high-strength induced multi-delamination. These micro-cracks are highly sensitive and resistant to external applied force and have an excellent energy absorption capability. The Super Steel embodies two major advantages over conventional counterparts: attaining high efficiencies at economical

raw-material costs with simple industrial processing. The cost of this ultrastrong steel is 20% of the cost of the maraging steel which is commonly used in aerospace as well as military and defence. The Super Steel has a chemical composition of Fe-9.95%Mn-0.44%C-1.87%Al-0.67%V (weight percent). All of these alloying elements have been widely used in the conventional steels. Of particular note is that the Steel can be developed by usual industrial processing routes, such as hot rolling, warm rolling, cold rolling and annealing. In a departure from complex metal fabrication processes, the commercial potential of the Super Steel is apparent and massive.

The Technology Transfer Office has lodged several patent applications for the Super Steel in the US, the EU and China. We also work right down to the wire to reach an agreement with industrial partners for mass production. Once the novel Super Steel is commercialised, it can be developed into service or products in different industries, such as superior bulletproof vests, bridge cables, lightweight automobile, military vehicles as well as high strength bolts and nuts. Further

tests and trials will be conducted to ensure the long-term safety and effective application of the invention, Professor Huang added.



Miss Liu (left) and Professor Huang (right) were showcasing their revolutionary Super Steel.

The findings of the Super Steel project were published in **Science**, the world's leading academic journal in the field, on 8 May 2020. To view the full paper "Making Ultrastrong Steel Tough by Grain-Boundary Delamination", please click [here](#).



# WHAT'S NEW?

## Welcome Dr. Zhao

We are excited to welcome Dr. Shawn Zhao from MIT to join us as the Deputy Director this July. Prior to joining HKU, Dr. Zhao was the Program Director of the Office of Corporate Relations (OCR) at MIT. He has many years of successful domestic and Asian business development, technology transfer, and product development experience in many industries including batteries/battery materials, separation/filtration, and composite materials. Before joining MIT OCR, he was V.P. of Commercial Development and Director of Product Development at Porous Power Technologies/Ahlstrom Group in Shanghai where he enjoyed success in sales, establishing collaborations with a US National Lab, and building Alstom's Shanghai Technology Center.

Dr. Zhao earned his Ph.D. in Physical Chemistry from MIT, completing his Thesis under Professor Mark S. Wrighton on "Electron Transfer and Energy Transfer in Photo-active and Electro-active Molecules in Solution and at Interfaces". He has many affiliations including as Executive Director of the Board of 128 CUTE, as Adjunct Professor of Lanzhou Jiaotong University, as a member of the American Chemical Society, as a member of the Electrochemical Society, and as a member of the Material Research Society. Please welcome Dr. Shawn Zhao!

## Our WeChat Launch

We are delighted to expand our community with launching our official WeChat account. Please scan the QR code. Check out our latest updates at your fingertips.



## Remarkable Efforts


TTO has been committed to extending the impact of HKU research to the society at large. In July, our business development team has worked on 76 TT cases in total, of which 59 of them were related to technology commercialization and industry engagement, 5 were related to entrepreneurship and incubation support and the remaining 12 were related to TT marketing and outreaching activities. Our legal team has managed 76 cases for our HKU research community while our intellectual property team has worked on 8 IDFs, handled 49 office actions, discussed 16 cases about Conversion/National Phase /National Validation, as well as filed 22 PCT/national applications. Teams at TTO are always here in full force. Please contact us if you need any assistance.


### 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.



## ***How to Apply: 4 Phrases 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.