Science published a super steel developed by a Beijing-HK-Taiwan team led by HKU

港大率京港台年輕科學家研發突破性「超級鋼」獲《*科學*》發表

B.B. He[1], B. Hu[2], H.W. Yen[3], G.J. Cheng[3], Z.K. Wang[4], H.W. Luo[2*], **M.X. Huang**[1*]

[1]Department of Mechanical Engineering, The University of Hong Kong, **Hong Kong**, China.
[2]School of Metallurgical and Ecological Engineering, University of Science and Technology Beijing, Xue Yuan Lu 30, **Beijing** 100083, China.
[3]Department of Materials Science and Engineering, National Taiwan University, **Taiwan**.
[4]Department of Mechanical and Biomedical Engineering, City University of Hong Kong, **Hong Kong** China.

Download paper 文章下載
http://science.sciencemag.org/content/early/2017/08/23/science.aan0177.full

DOI: 10.1126/science.aan0177

香 港 大 學
THE UNIVERSITY OF HONG KONG

25 Aug. 2017

Core members
核心成員

港京台青年科學家精誠合作的典型成功範例：
A successful example of collaboration of young scientists from Hong Kong, Beijing and Taiwan

1. 香港大學機械工程系的**黃明欣博士**團隊　Dr. Huang Mingxin's team from HKU
2. 北京科技大學的羅海文博士團隊　Dr. Luo Haiwen's tearm from USTB
3. 國立臺灣大學的顏鴻威博士團隊 Dr. Yen Hung-wei's team from NTU
4. 香港城市大學王鑽開博士團隊 Dr. Wang Zuankai's team from City U

文章的第一作者是黃明欣團隊的**博士後何斌斌**，通訊作者為香港大學**黃明欣博士**和北京科技大學**羅海文博士**。
The first author of this paper is Dr He Binbin who is currently a post-doctoral fellow in Dr Huang's group. The corresponding authors are Dr Huang Mingxin from the University of Hong Kong and Dr Luo Haiwen from University of Science and Technology Beijing.

該論文作者為 The complete author list is as below:
B.B. He, B. Hu, H.W. Yen, G.J. Cheng, Z.K. Wang, H.W. Luo, M.X. Huang。

Application of super strong steels
高強度鋼鐵的應用領域

Automobile汽車

Bridge 大橋

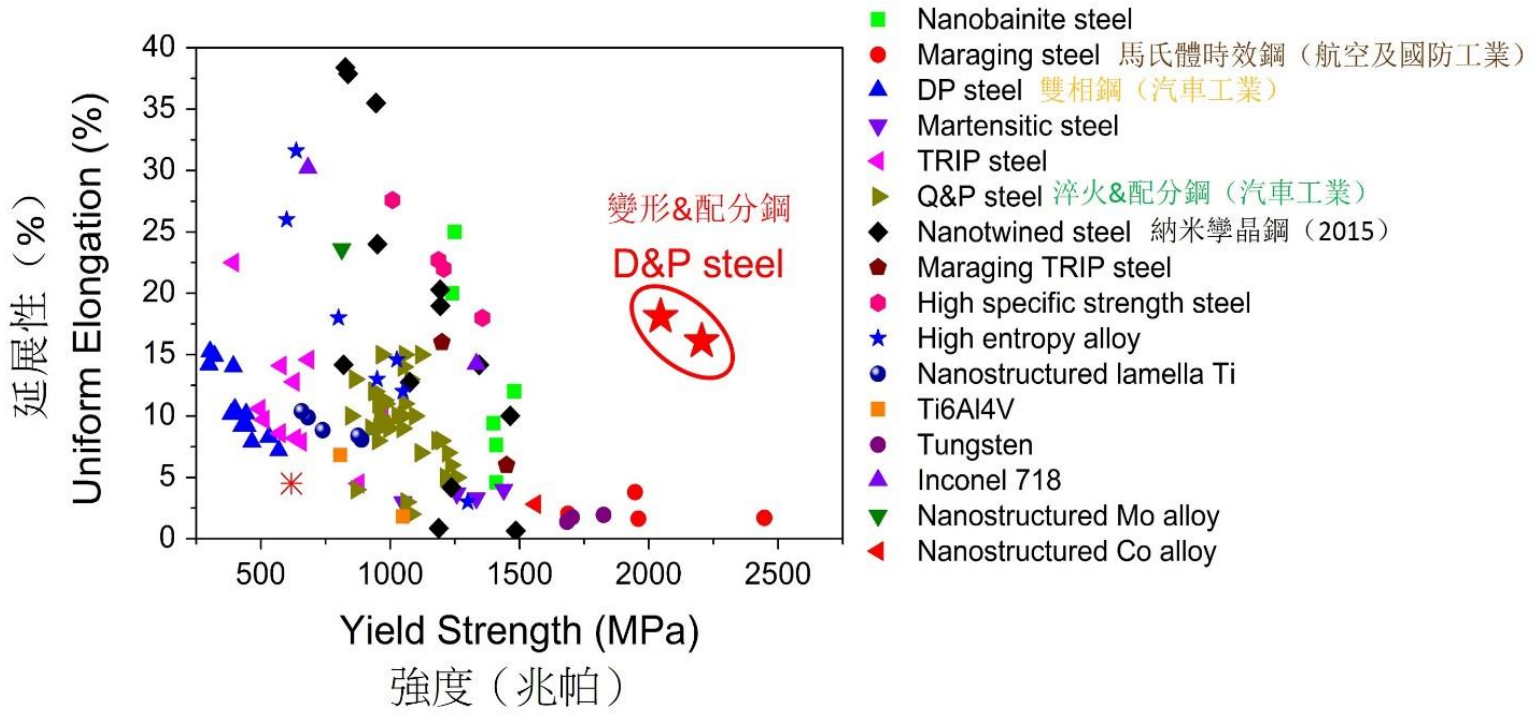
Aerospace 航空

Special steels 特種鋼

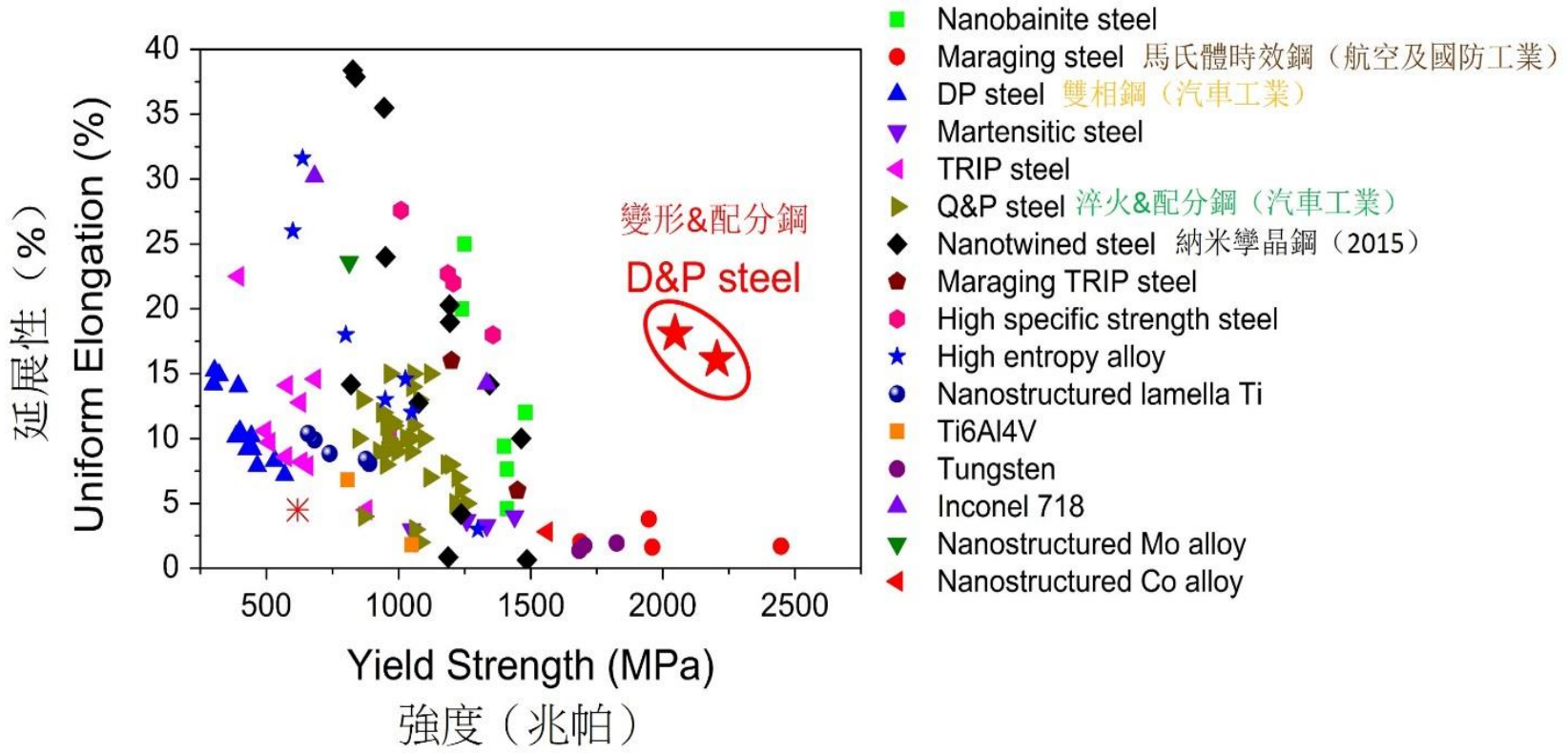
weight reduction 車身減重

Galvanized Steel Wire 鍍鋅鋼絲

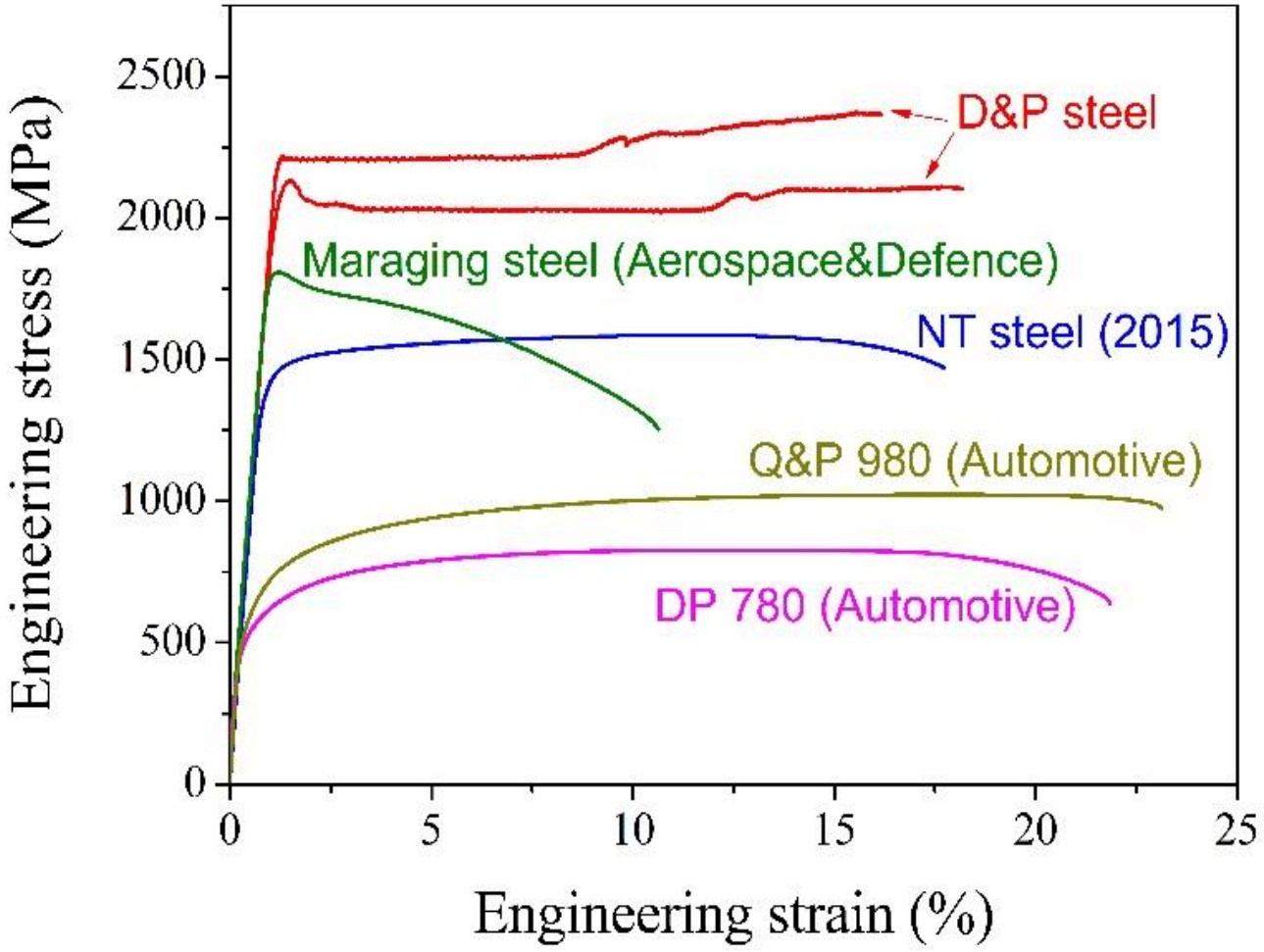
Strength-ductility trade-off
強度和延展性：魚和熊掌的關系



Comparing the present super steel （deformed and Patitioned, D&P, steel）to other metals 與其它金屬材料的對比



Comparing the present super steel （deformed and Patitioned, D&P, steel）to other metals 與其它金屬材料的對比

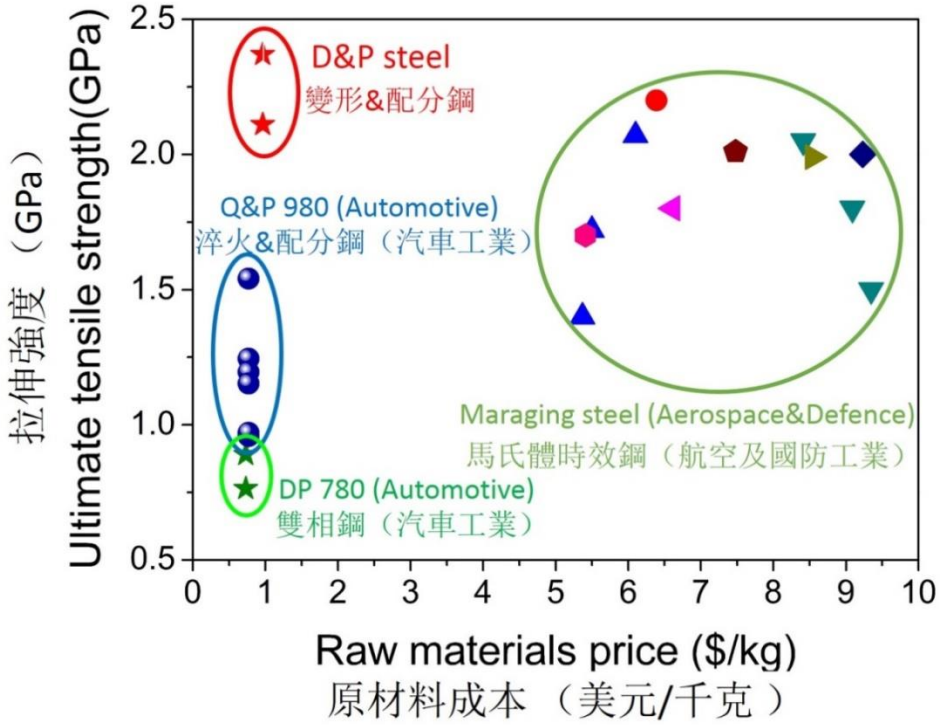


Advantages of the present super steel
此次研發的超級鋼的優點

1）合金成本較低。本發明的超級鋼是成分簡單的中錳鋼成分體系，含有10%錳，0.47%碳，2%鋁，0.7%釩（V）（質量百分比），這些都是現在廣泛使用的鋼材料中常見的合金元素。

Low raw-materials cost. The chemical composition of this breakthrough steel belongs to medium manganese (Mn) steel, containing 10% manganese, 0.47% carbon, 2% aluminium, 0.7% vanadium (mass percent), the balance is iron. All of these alloying elements have been widely used in the conventional steels.

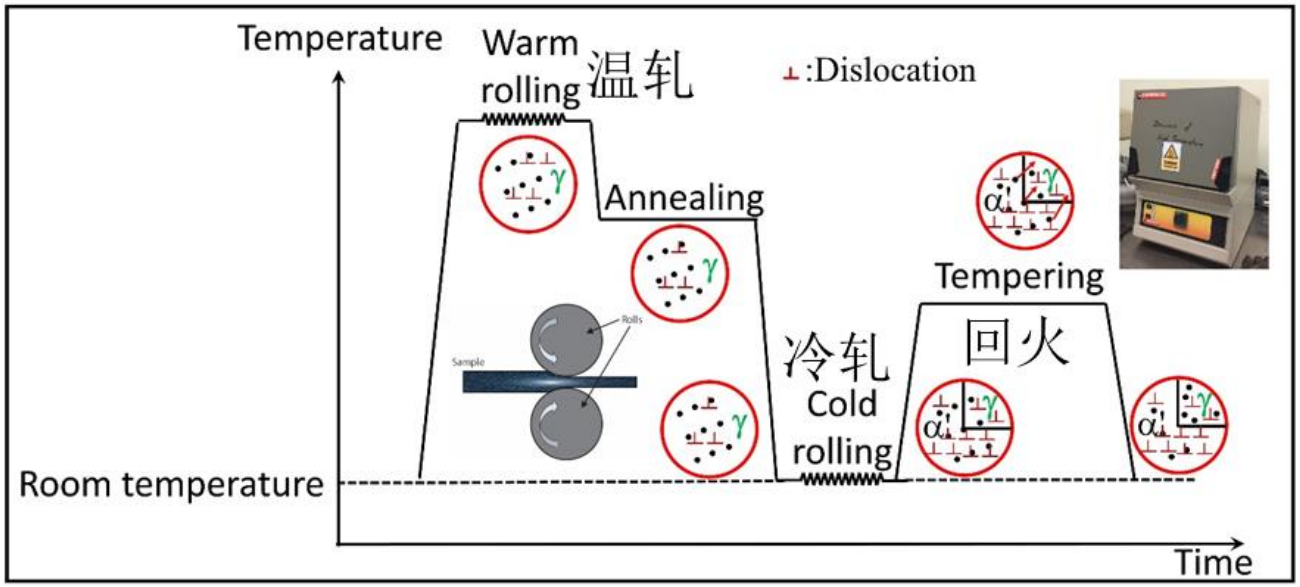
Raw material cost
~20% of maraging steel (aerospace)
原材料成本大約為航空用的馬氏體時效鋼的20%



Advantages of the present super steel
此次研發的超級鋼的優點

2）該鋼通過在工業界廣泛使用的加工工藝來制備，如熱軋、冷軋、熱處理等常規工業制備工藝，而不是采用那些難以規模化工業生產的特殊加工工藝制備。因此，本發明的超級鋼，具備直接在鋼鐵企業進行百噸級規模工業化生產的巨大潛力。

This breakthrough steel is developed by using the conventional industrial processing routes including warm rolling, cold rolling and annealing. This is different from the development of other metallic materials where the fabrication processes involve complex routes, which are difficult to scale-up. Therefore, it is expected that the present breakthrough steel has a great potential for industrial mass production of hundreds of tons.

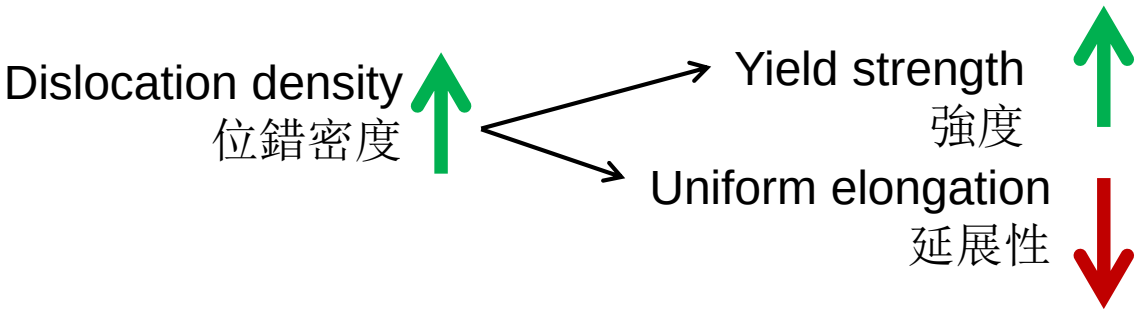


香 港 大 學
THE UNIVERSITY OF HONG KONG

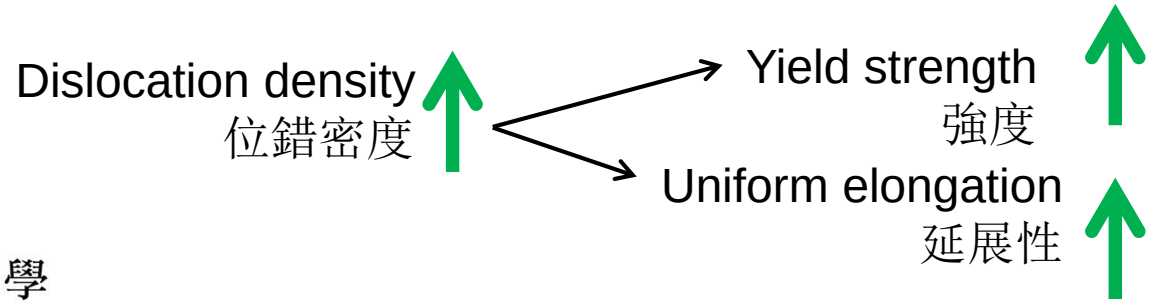
New scientific discovery on dislocation mechanism 位錯機理方面的新的科學發現

Dislocations are defects in metals.
位錯是金屬材料的中的一種缺陷

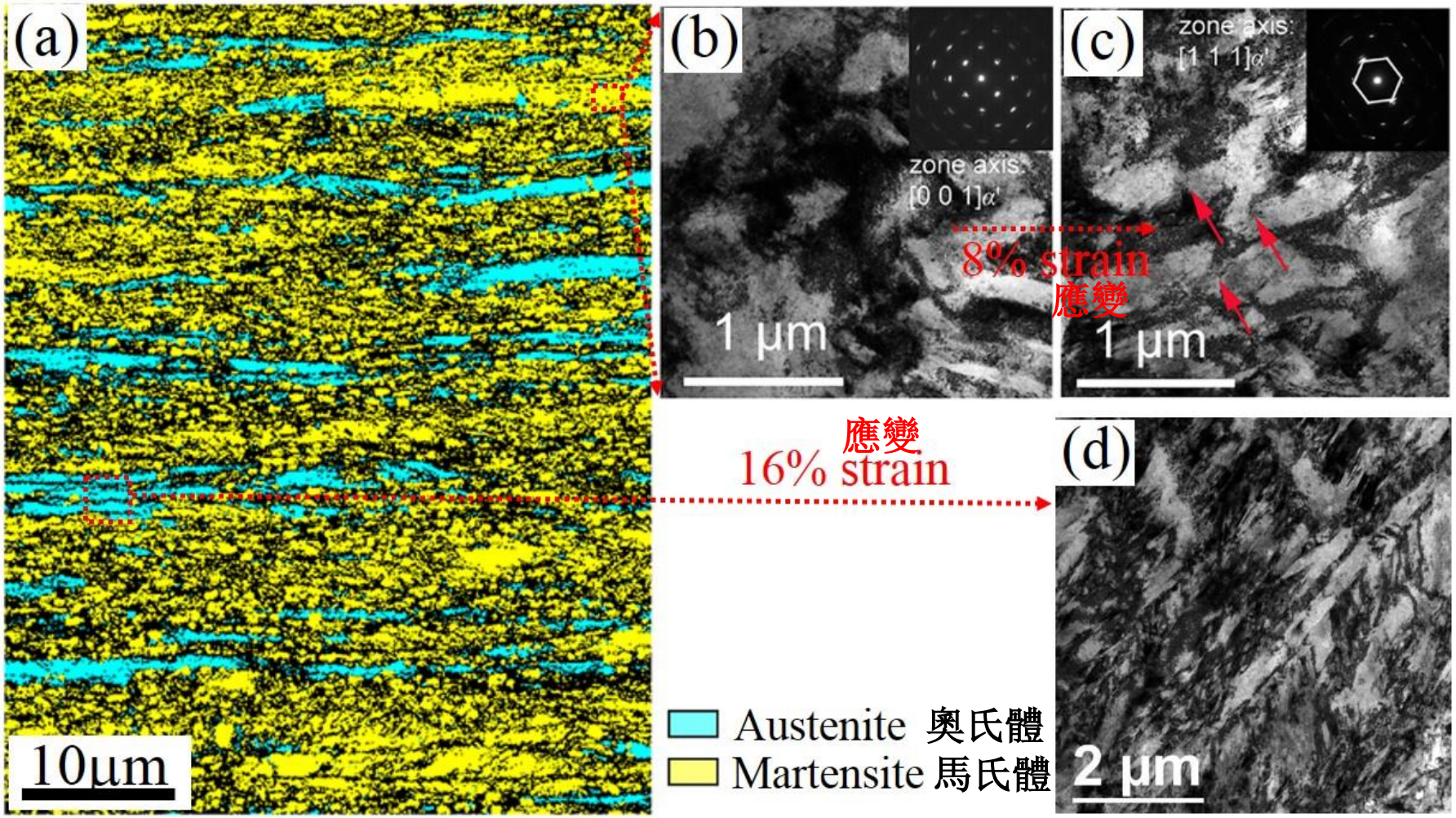
Classical dislocation theory
經典位錯理論



New dislocation mechanism
此次研究提出的新位錯機理



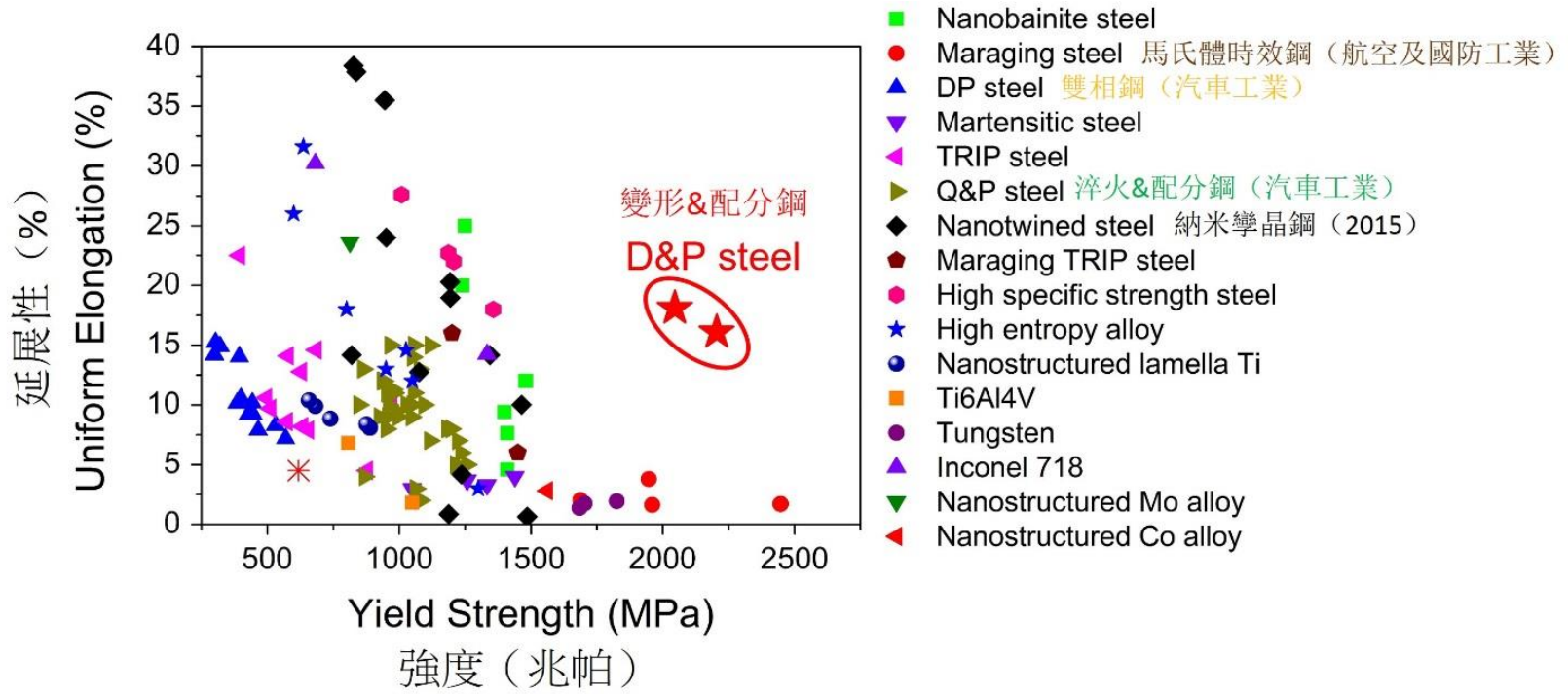
Microstructure evidences
組織結構證據



Summary
結論

- A super steel
- Low cost
- Conventional pressing routes
- New dislocation mechanism

- 超級鋼
- 低成本
- 常用的加工工藝
- 新的位錯機理



Thank you!

謝謝！