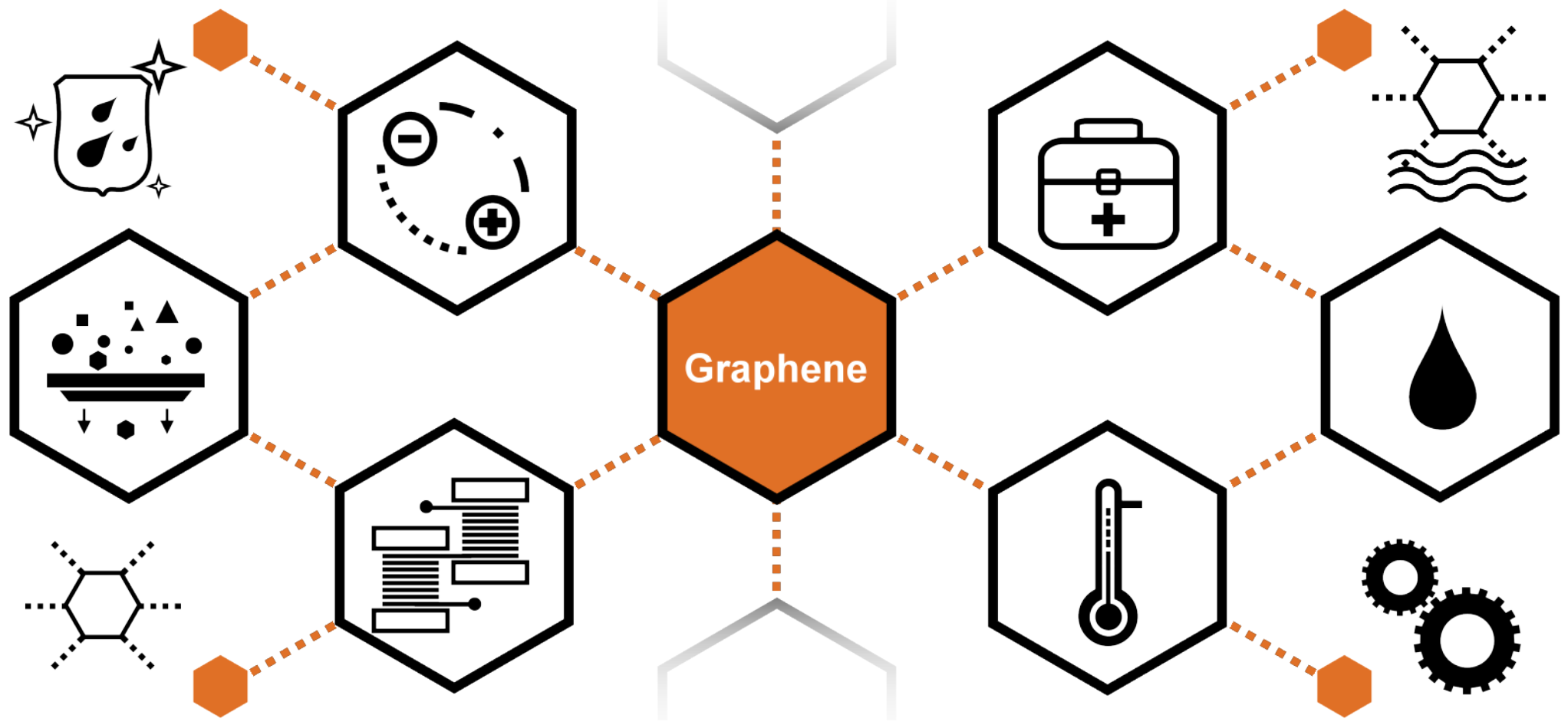


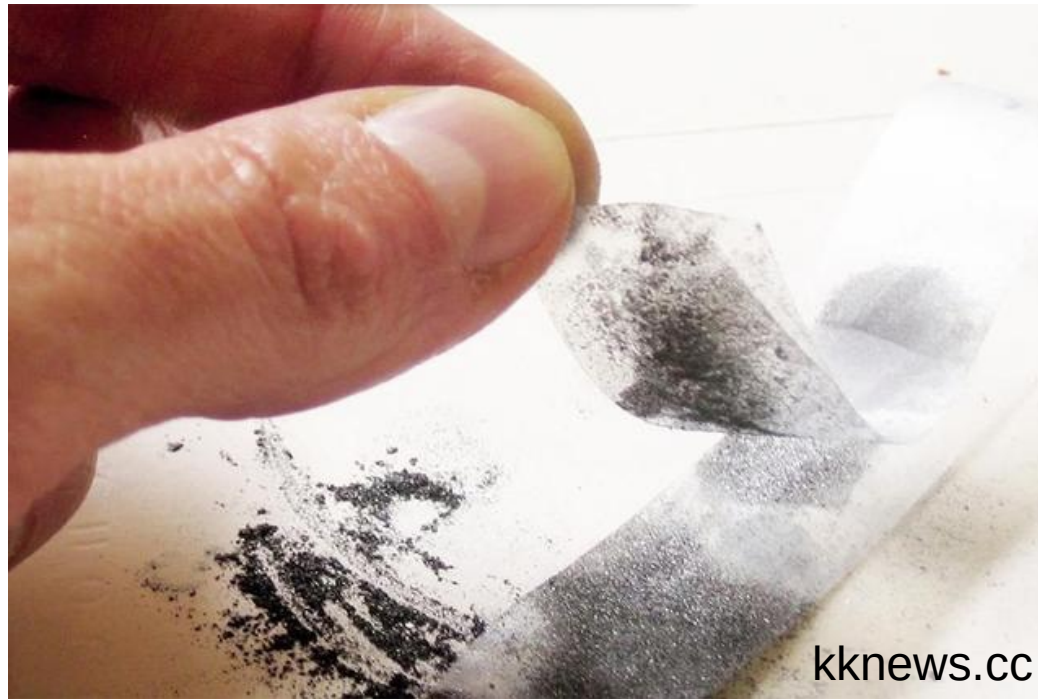
點石成金



The Midas' Touch



人人皆可做石墨烯
Anyone Can Make Graphene



但不是人人可以量產石墨烯
Not Everyone Can Do It on a Large Scale

光做出石墨烯不代表成功

Making Only Graphene ≠ Success

應用遍地開花 個別企業很難通吃市場

因為石墨烯是粉末，很細、很輕，密度非常低，甚至可以飄起來。吳以舜舉例，要把石墨烯混到不同異質產品裡，要放多少？如何放？實驗階段面臨很大挑戰。

安炬科技開發的石墨烯噴漆，已成功應用於發光二極體（LED）燈具背後的鋁製散熱鰭片。吳以舜舉例，現在噴漆也是石墨烯愈來愈常見的應用，噴到 LED 燈具背後的鋁製散熱鰭片，可提高燈具均勻導熱的效果。「在鋁製的散熱鰭片上，噴上石墨烯材料，可提高導熱效果 8 至 15%。」

但噴漆是否可以很好的附著在物體上面，並不是單純把石墨烯摻到漆裡就可以，這與配方與表面改質都有關係。「每一種應用就是需要完全不同的配方，能不能很容易的改質，與石墨烯廠商對於石墨烯材料及特性的掌握度息息相關。」吳以舜說。

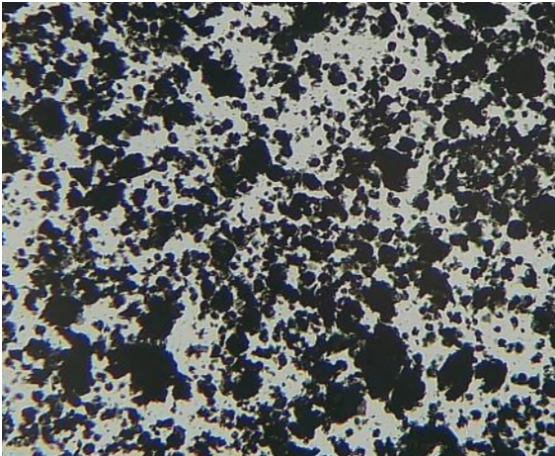
也因此，石墨烯供應商必須嘗試與不同的下游應用廠商，合作調配石墨烯的配方，這樣才能讓下游應用廠商直接使用。
例如 AMI 正與台灣輪胎與腳踏車的複合材料、抗腐蝕塗料等應用廠商，一起開發產品。

財訊 2016 年 1 月 24 日

石墨烯改質 / 應用 / 配方更重要

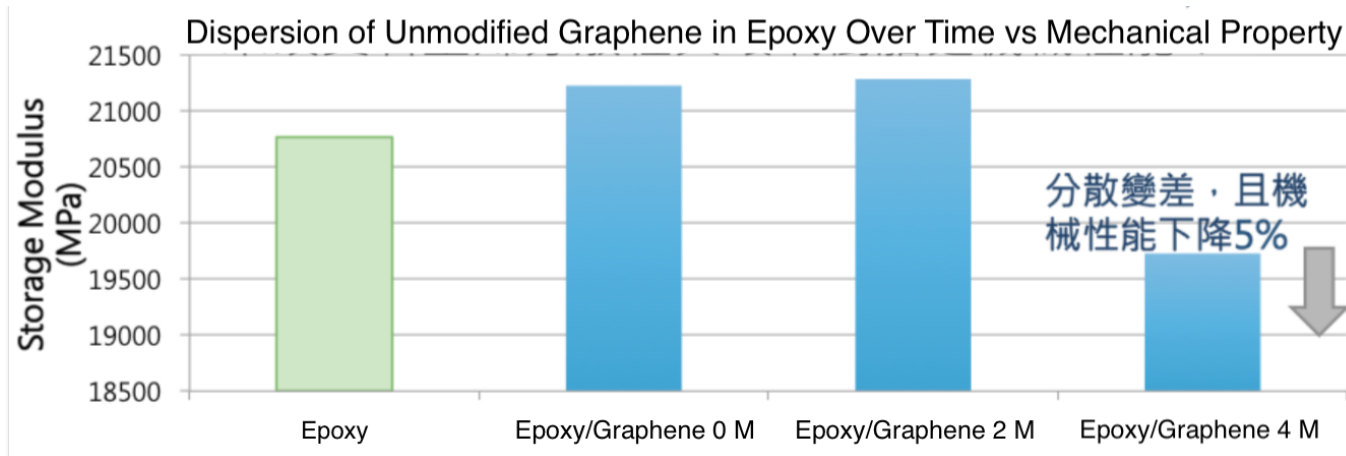
Graphene Modification/Formulation/Application Are More Important

如何分散均勻才是重點
Dispersion Is the Key to Success

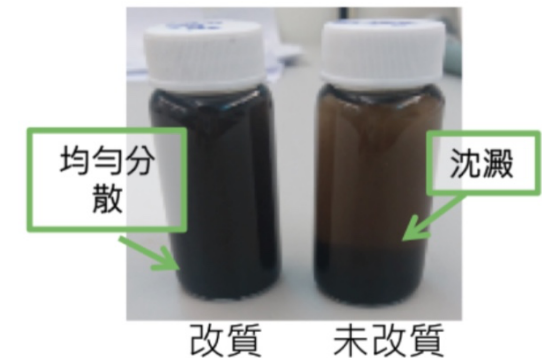


分散性 vs 物性

Dispersion vs Mechanical Properties



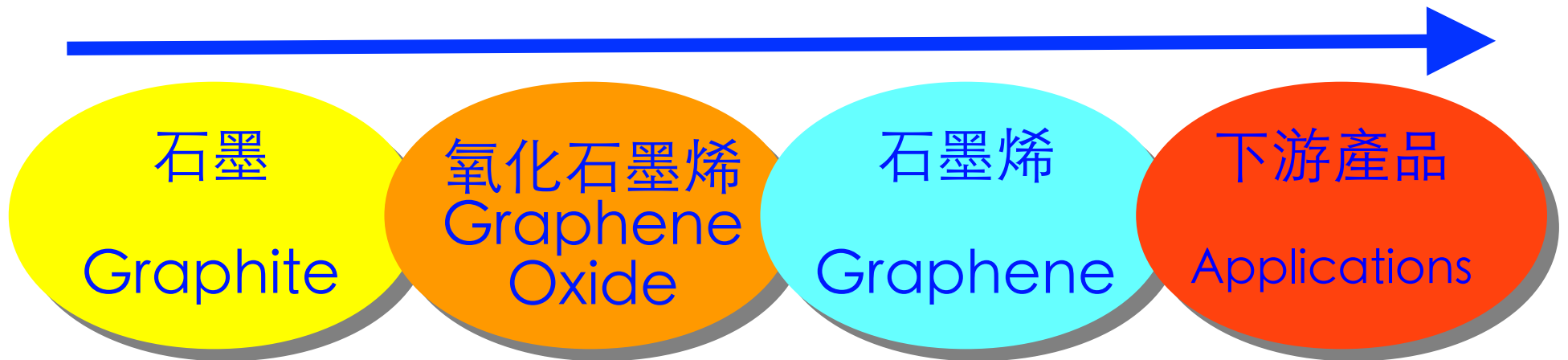
改質與未改質石墨烯在油性溶劑之分散性：



分散均勻才會有好的效果

Good Dispersion Yields Optimal Results

量產石墨烯 Scaled Up Production of Graphene



It takes more than just a roll of Scotch Tape!!!



環球石墨烯集團



Taiwan Graphene Co., Ltd.

台灣石墨烯



ANGSTRON MATERIALS

台灣安固強股份有限公司

創辦人 Founders



張博增教授
Dr. Bor Jang



紮姆阿茹娜博士
Dr. Aruna Zhamu

相輔相成 Complementing Each Other



1. 特用化學品製造
2. 複合材料開發
3. 石墨烯前驅物製造

2012年~
供應Angstrom Materials
Inc.(AMI)石墨烯前驅物



1. 氧化石墨烯製造生產
2. 石墨烯原料製造生產
3. 通過ISO9001認證

2014年~
投資台灣石墨烯股份有
限公司(TGC)

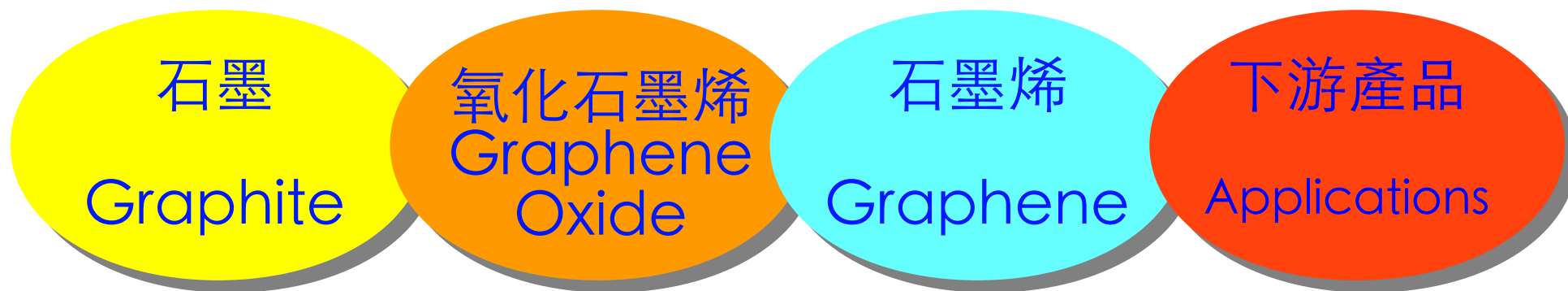


Taiwan Graphene Co., Ltd.
台灣石墨烯股份有限公司

- 2014年~
1. 成立子公司Taiwan Graphene Co.(TGC) ·
 2. 供應石墨烯原料給TGC製造中下游應用端產品

1. 開發改質石墨烯原料
2. 石墨烯應用產品開發

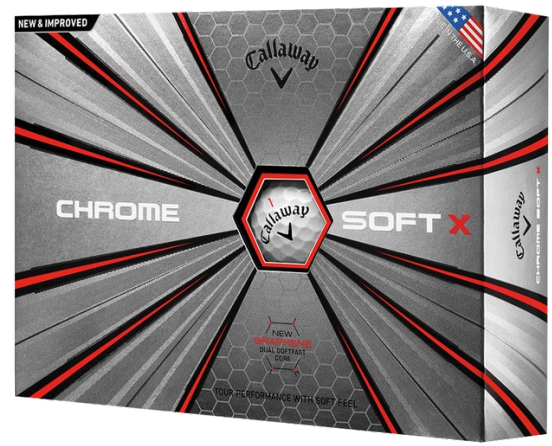
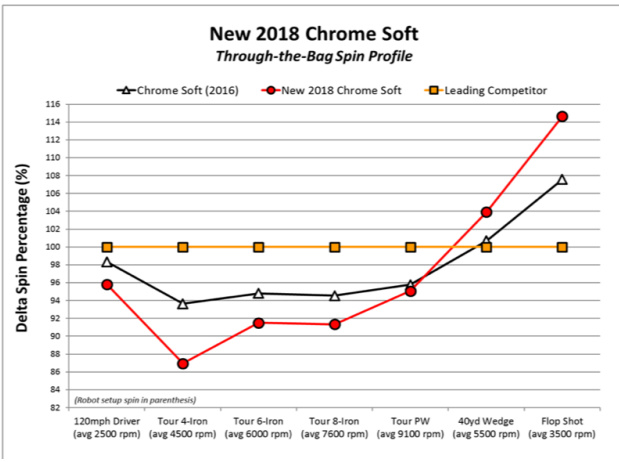
初期合作分工模式 Old Framework of Partnership



新定位 A New Alliance

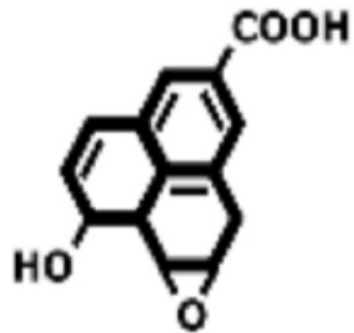


Callaway's Graphene Based Golf Ball

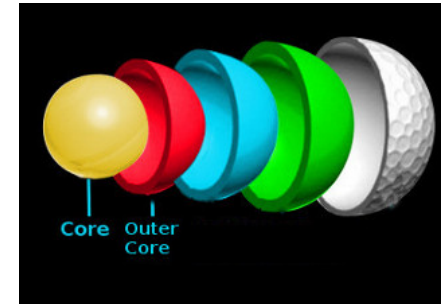


氧化石墨烯為基材的新一代架橋劑

A Novel Crosslinker Based on Graphene Oxide

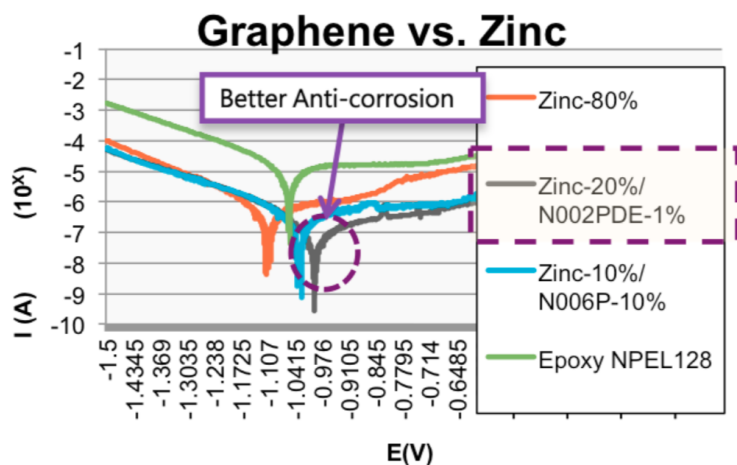


氧化石墨烯
Graphene Oxide



Adding graphene directly onto polymer matrix yields better performance than just blending

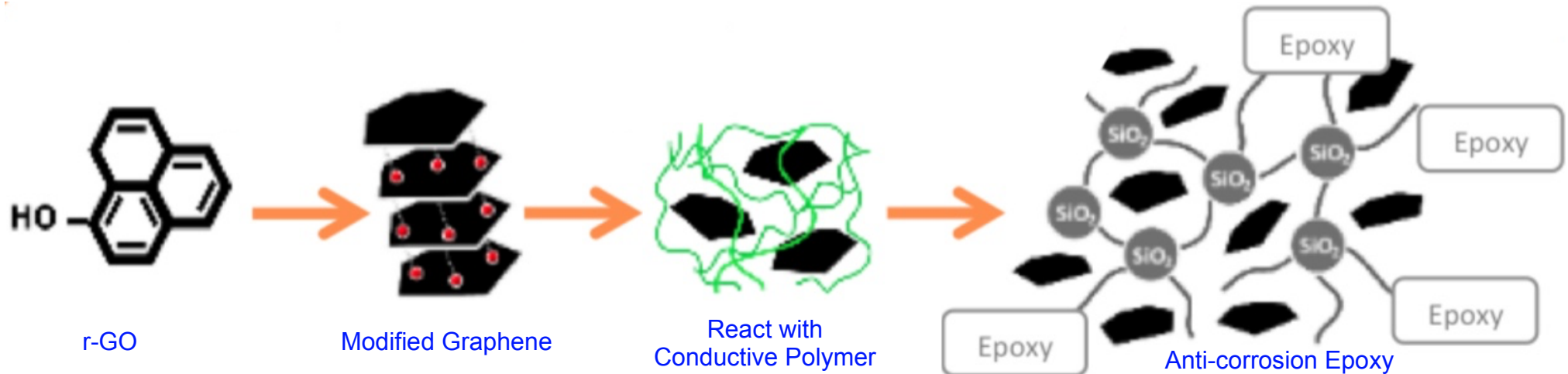
石墨烯在抗腐蝕上有良好的表現 Graphene Has a Better Anti-corrosion Performance



底漆附著力比較 (百格測試)



石墨烯 + 共軛高分子 Graphene+Conductive Polymer



Adding modified graphene together with conductive polymer could offer even better anti-corrosion property

石墨烯改質潤滑油

Graphene modified lubricant



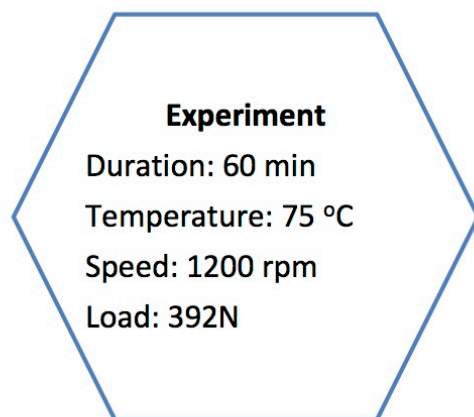
Previous Name: Shell Omala HD

Shell Omala S4 GX
Advanced Synthetic Industrial Gear Oil

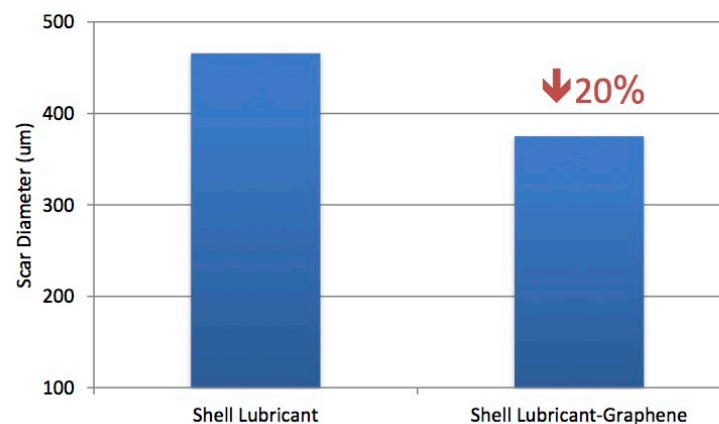
- Shell S4GX is the lubricant for industrial gears.
- The addition of graphene provides lower COF, wear loss, and scar diameter.

Against Extreme Pressure

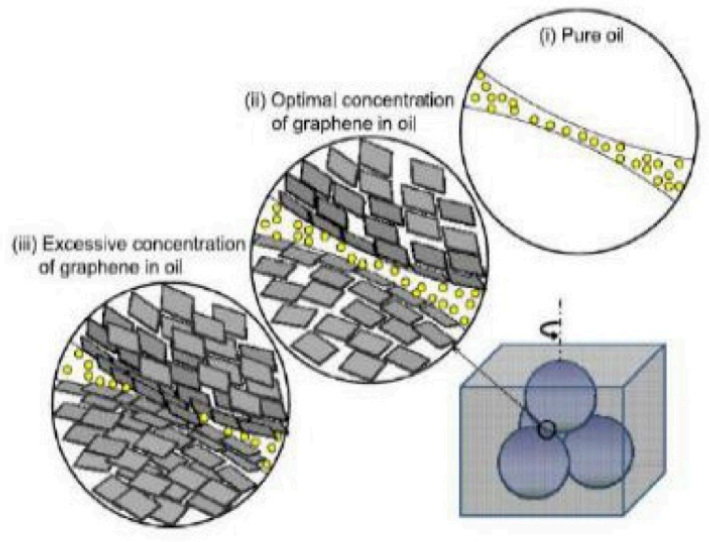
◇ Four-ball wear test for extreme pressure property:
With the protection of graphene, the scar diameter of wear decreases 20%.



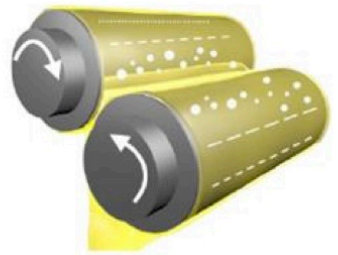
Four-Ball Extreme Pressure Test



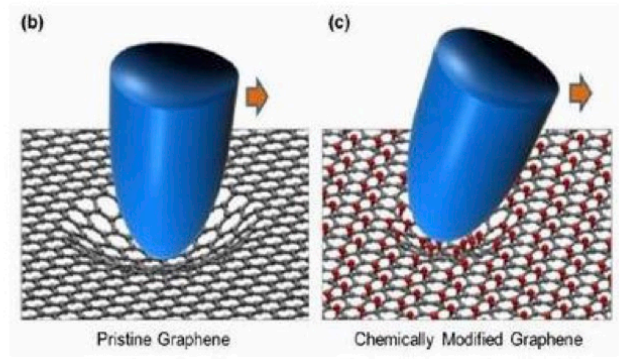
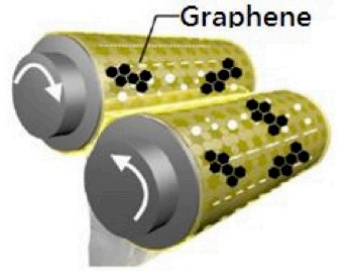
Mechanism of graphene-based lubricant



Lubricant

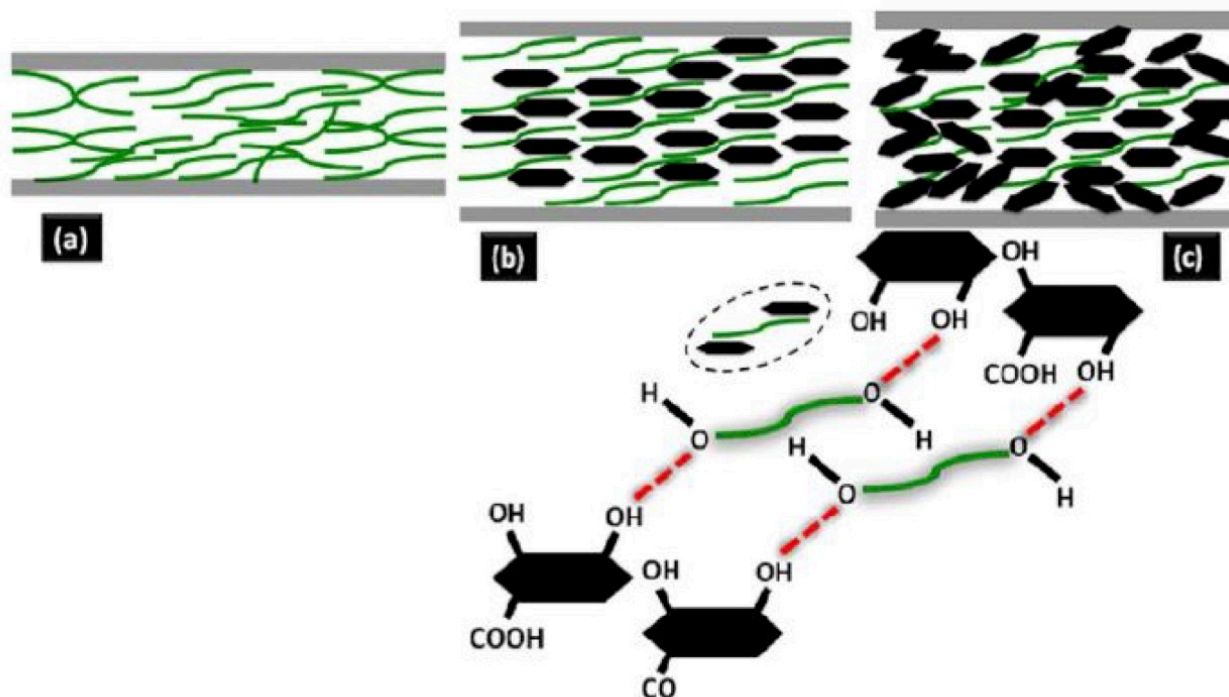


Graphene lubricant

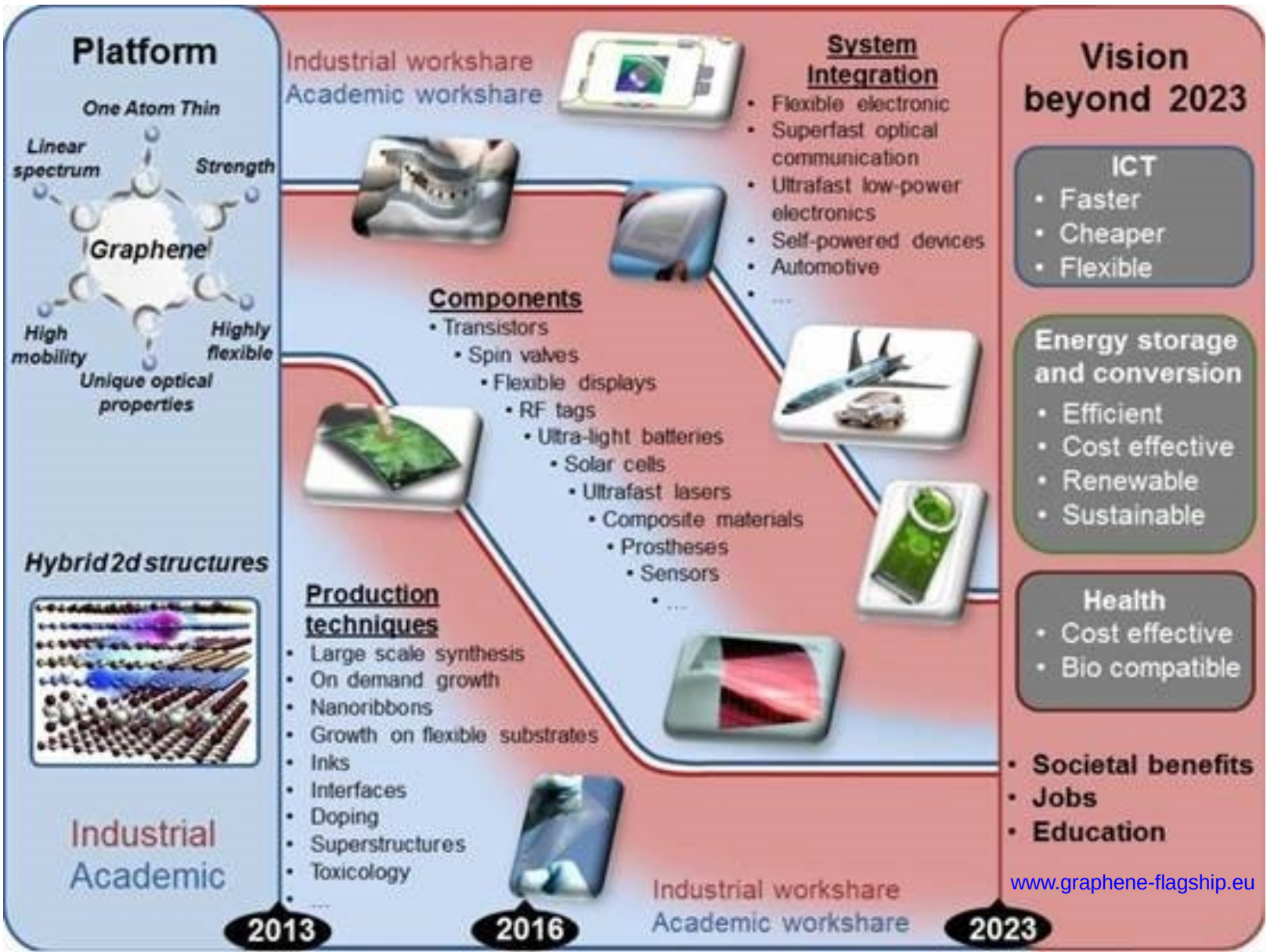


改質石墨烯可以更均勻分散在潤滑油裡

Chemical modified graphene lubricant



Lubrication mechanism in (a) PEG steel-steel contact (b) low conc. rGO-PEG lubricated contact and (c) High conc. rGO-PEG lubricated contact.



點石鐵定會成金
Graphite Shall Turn into Gold

