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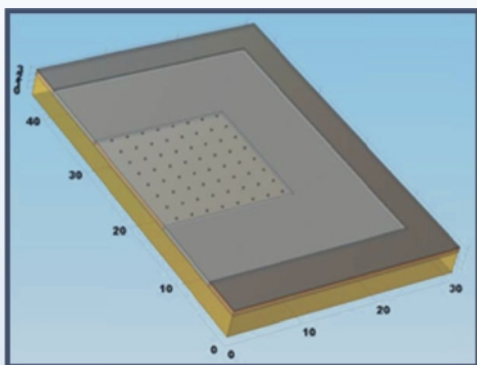
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袁俊傑 教授

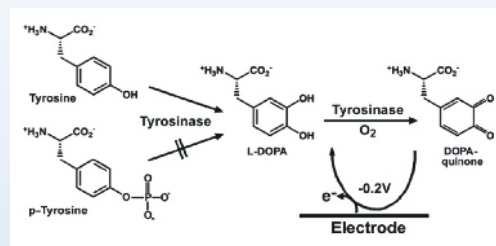
研究興趣



The CMOS sensing chip with 3D-NEA

我實驗室的研究方向有(一)電化學生物感測技術的開發與應用、(二)利用仿生技術製作標靶分子與磁性奈米粒子複合體及(三)研究蛋白激酶Mst3在粒線體上的生理功能。

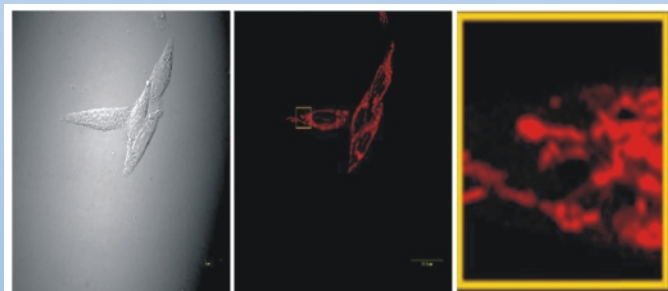
在電化學生物感測技術的開發與應用上，我們開發了一款以半導體標準製程製作的感測晶片(見下圖左)，該半導體感測晶片的工作電極為一組8x8的奈米柱陣列(稱之為3維奈米電極陣列或3D-NEA)，在後續研究中，我們發現3維奈米電極陣列感測晶片具有高電流密度、反應快及高靈敏度的電化學特性，這些結果顯示3維奈米電極陣列感測晶片在未來生醫應用如，臨床診斷、定點照護元件的開發上具有極大之潛力。我們亦開發了檢測蛋白激酶活性的感測器如，蛋白激酶A感測器及Src蛋白酪胺酸激酶感測器，這些感測器可應用在生醫研究與診斷上，例如，可作為細胞訊息傳遞機轉研究上有用的工具，亦可用於臨床診斷及蛋白酪胺酸激酶抑制物的篩選。



Determination of tyrosine kinase activity

我們亦利用仿生技術，開發出一種在室溫以單步驟成型技術來製造分子/磁性奈米粒子的複合體。此生物分子/磁性奈米粒子的複合體將繼續開發研究，使之能應用於細胞分子影像、臨床診斷及藥物載體的用途。

Mst3是一個人類Ste20蛋白的蛋白激酶，近期我們發現Mst3不只存在於細胞質內，亦可發現於粒線體內外膜間空隙中，這個發現暗示Mst3可能參與了粒線體內電子傳遞鏈與氧化磷酸化活性的調控。我們後續將研究Mst3在粒線體的功能、代謝作用、型態變化及細胞逆境反應上所扮演的角色。

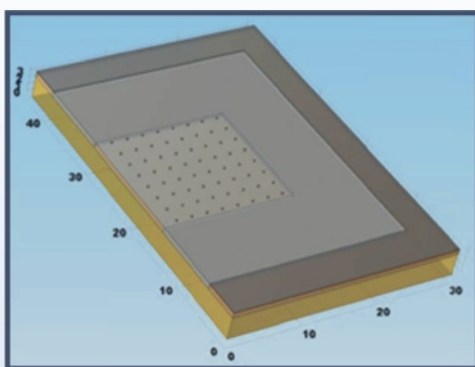




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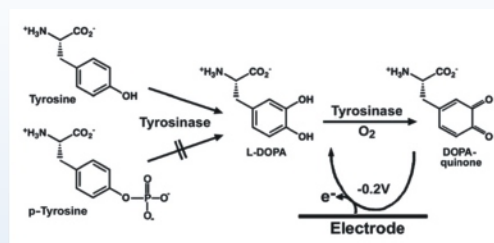
Research Interests



The CMOS sensing chip with 3D-NEA

Our lab mainly focuses on three research areas: i) The development of biosensors and biochips for biomedical applications; ii) The biomimetic synthesis of bionanomaterials for molecular imaging and drug delivery and iii) The research on the roles and physiological functions of Mst3 in mitochondria.

In the development of biosensors and biochips, we have developed and fabricated a novel 3D nanoelectrode array (3D-NEA)-based sensor chip by the standard CMOS process. We have demonstrated that the fabricated 3D-NEA chip exhibits high current density, quick response and high sensitivity to analytes. These results show that 3D-NEA chip has great potential for the development of biosensing system for many applications, including clinical diagnosis, food analysis, and point-of-care devices. We also developed amperometric biosensors for protein serine/threonine kinases and protein tyrosine kinases. These protein kinase biosensors can be used for the cellular physiological studies, clinical diagnosis, drug screening and drug test.



Determination of tyrosine kinase activity

In the biomimetic synthesis of bionanomaterials we have established a single-step biomimetic process to generate biomolecule-conjugated magnetic nanoparticles (MNP) under the ambient condition. Biomolecule-conjugated MNP exhibits potential in the applications of molecular imaging, clinical diagnosis, drug delivery and therapy.

Mst3, a human Ste20-like protein serine/threonine kinase, was recently found to exist in the mitochondrial intermembrane space, where it may regulate the activity of oxidative phosphorylation of mitochondria. Interestingly, we have found that the selective knock down of Mst3 in cells led to acidification of medium, reduction of oxygen consumption and ATP synthesis and cell cycle arrest. In summary, Mst3 play an important role in regulating the mitochondrial function and their morphology dynamics.

