

# 通過激光激活納米複合材料/石墨烯碳材料製造納米電子產品的微電路

## Laser activation of nanocomposites / graphene carbonaceous materials for micro-circuitry production in nanoelectronics

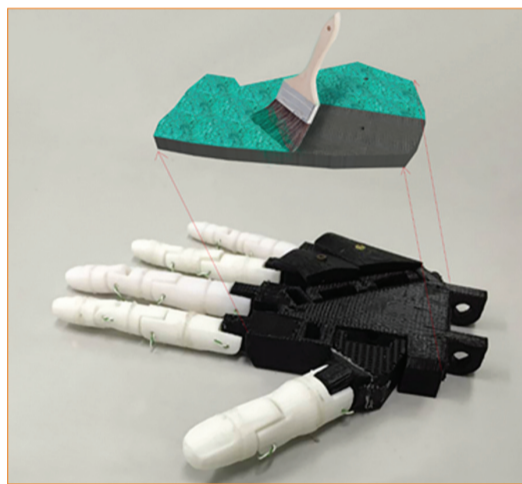
### 簡單而合乎成本效益的微電路製造方法

### A simple and cost-effective method to create micro-circuits

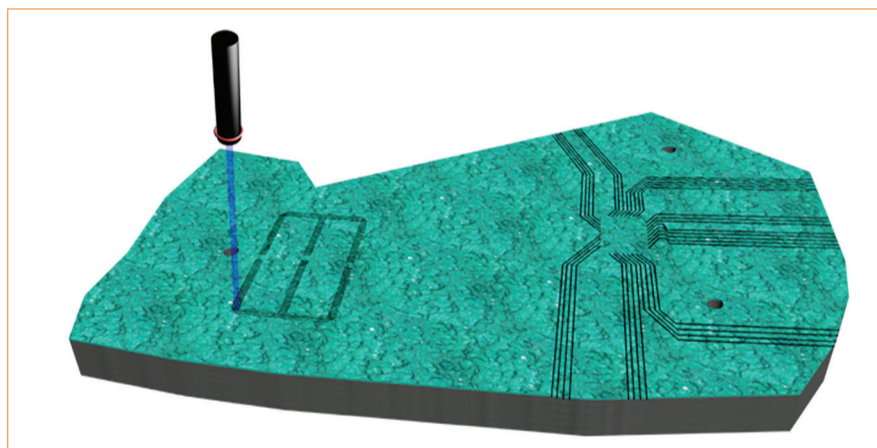
專利編號：201510760302.3(中國)

傳統模塑互連器件製造牽涉昂貴而複雜的注射成型和模具設計工序。為了降低成本和簡化工序，團隊研發出適用於納米電子工業的嶄新微電路製造方法。首先，團隊把含有石墨烯和金屬有機複合粉末的溶液塗於以熱塑性（例如 ABS）材料製成的立體物件表面，然後用激光激活該物件，以在其表面形成具有已降低和可控電阻的電路。本發明需要較少部件，而且在熱塑性材料上製造電路比傳統方法便宜。

在含有孔雀石的塗料上進行選擇性激光圖案化：  
Selective laser patterning on the paint containing malachite:



(a) 在 3D 打印的機械人手上塗上含有孔雀石的丙烯酸塗料  
A part of a 3D printed robot hand was brush-coated with the acrylic paint containing malachite



(b) 以激光在塗料上寫入互連電路圖案的軌道  
Tracks for patterning the interconnection circuits are laser-written on the paint

Traditional manufacturing for molded interconnect devices requires the use of injection molding and mold design, which are expensive and complex. To address this issue, the team has developed a new and simple way to produce micro-circuits for nanoelectronics. First, a solution doped with graphene carbonaceous and metallic-organic composite powders is applied to the surface of a 3D object made of thermoplastic (e.g. ABS) materials. The coated 3D object is then activated through a laser process to form circuit track structures with a reduced and controlled electrical resistance on its surface. This novel method requires less parts and it is cheaper to manufacture circuit tracks on thermoplastics composites.

#### Principal Investigator

Ir Prof. Kam-chuen YUNG

Department of Industrial and Systems Engineering

#### Contact Details

Knowledge Transfer and Entrepreneurship Office

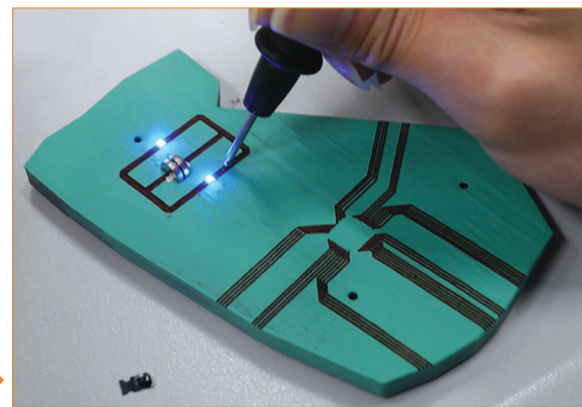
Tel: (852) 3400 2929 Email: info.kteo@polyu.edu.hk

#### 特色與優點

- 此簡單的方法可在立體物件上製造複雜的微電路，可提升生產效率和靈活性，亦適用於原型製作。
- 此生產方法透過激光激活溶液令微電路成型，過程並不涉及注射成型和模具設計工序，因為成本比傳統方法低。

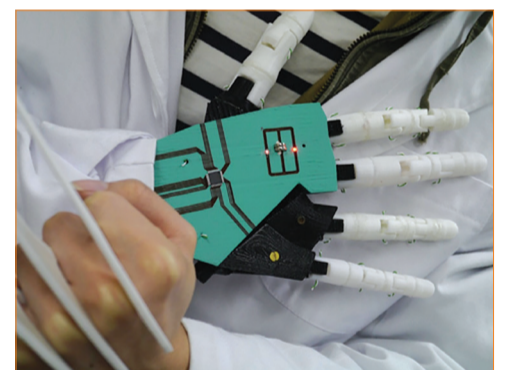
#### 應用

- 家用電器，例如LED燈泡
- 醫療器材，例如血糖儀
- 機械工程，例如IC傳感器
- 消費電子產品，例如手機



(c) 組裝合成電路，並測試該合成電路是否能為藍色 LED 供電  
The synthesised circuits are assembled and tested for powering up blue LEDs

完成後的機械人手備有片上電池、紅色 LED 和微處理器，使用建議的塗層和激光圖案處理  
The finished robot hand is equipped with on-chip batteries, red LEDs and microprocessors



(d)

Patent Number: 201510760302.3 (China)

#### Special Features and Advantages

- This simple method is ideal for producing complex micro-circuits on 3D objects efficiently and flexibly. It is also suitable for prototyping.
- The micro-circuits are formed by using laser to activate the solution. It is more cost-effective than the tradition method that involves injection molding and mold design.

#### Applications

- Household appliances, e.g. LED light bulbs
- Medical devices, e.g. glucose meters
- Mechanical engineering, e.g. IC sensors
- Consumer electronics, e.g. cell phones



Access More info via mobile