

應用於電子及能源儲存裝置的 巨介電複合材料多層電容器

Composite Multi-layers Capacitors with Colossal Permittivity for Electronics and Energy Storage Applications

充電快、低電流失及高能量儲存密度的創新電容器

Novel capacitors with fast charging capability, low energy loss and high power density

專利申請編號及國家：62/663,340 (美國)

特色與優點

- 主要採用二氧化鈦聚合物為原材料：環保、無毒，而且蘊含量豐富
- 溶液澆鑄和熱壓技術：製作過程簡單，成本低
- 全固體結構的複合薄膜：可任意彎曲、摺疊，而且比傳統化學電池更安全

應用

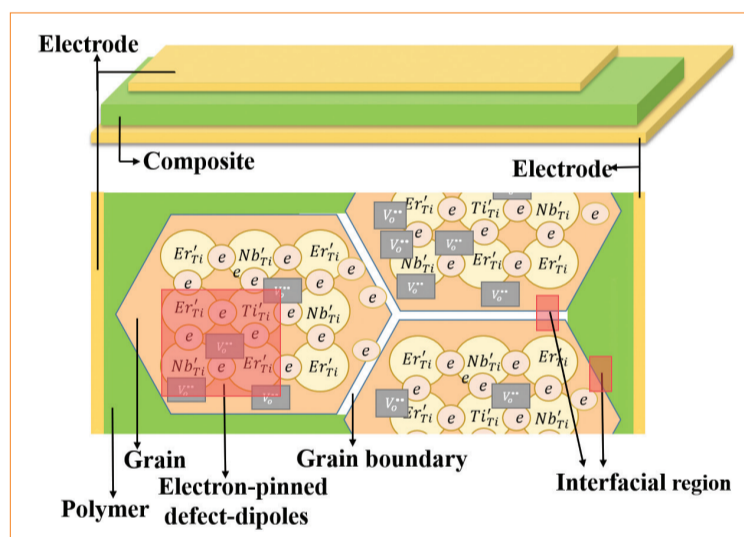
可彎曲、便攜式和可穿戴電子設備的柔性電源系統，如LED顯示、傳感器等

獎項

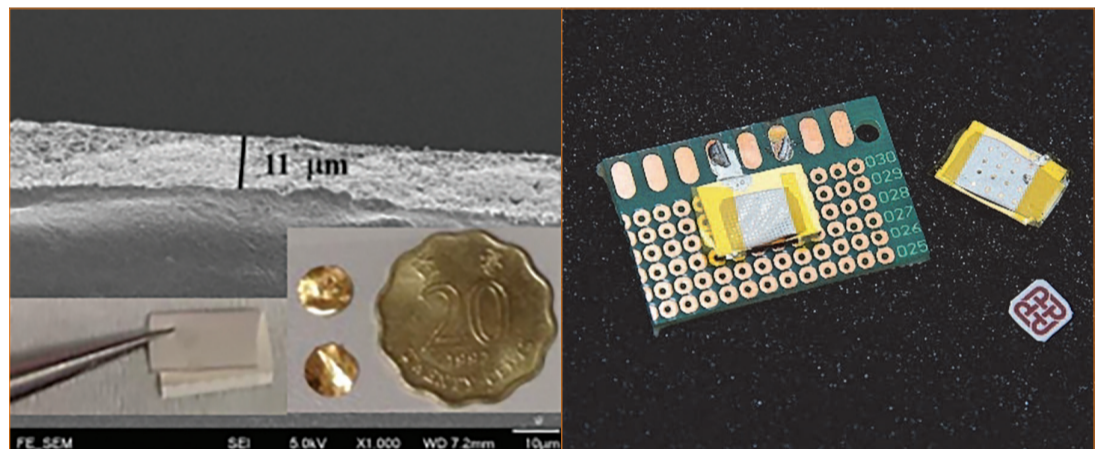
2018 TechConnect全球創新獎 (2018年5月)

隨著全球對能源存儲的需求迅速增長，市場對可快速充電、功率密度高和壽命長的電容器有很高的需求。理大研究團隊開發了一種新的巨介電電容器。它的巨介電來自介電常數高的材料，而介電常數愈高，能量的儲存容量則愈大。

此嶄新的電容器乃以聚合物及陶瓷物料製成，它可同時實現高介電常數、高能量密度，而且損耗極低，不易出現洩漏或浪費情況，換句話說，可以存儲較多能量；其多層薄膜結構可提高電容密度並大大縮小電容器的面積。與使用其他陶瓷顆粒填料的納米複合物相比，巨介電電容器無論在性能、體積和成本上，均較優勝。



複合材料多層電容器的微觀結構
The microstructure of composite multi-layers capacitors



複合材料多層電容器
Composite multi-layers capacitors

With global demand for energy storage growing rapidly, new capacitors which can achieve fast charging, high power density and long cycling lifetime are in high demand. The PolyU research team has developed a novel capacitor with colossal permittivity, which stems from materials that have a high dielectric constant, and a higher dielectric constant means that more energy can be stored.

This novel capacitor made of polymer/ceramic composites with colossal permittivity can simultaneously achieve high dielectric constant and high energy density with exceptionally low energy loss, i.e. a lot of energy can be stored without leaking and being wasted easily. The multi-layer structure increases the capacitive density and drastically reduces the capacitor area, offering performance, volume and cost advantages over nano-composites with other ceramic particle fillers.

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Patent Application No: 62/663,340 (US)

Special Features and Advantages

- The host (titanium dioxide polymer) used is environmentally friendly, non-toxic and abundant in source.
- Solution casting and hot-pressing technique: easy fabrication and low cost
- Composite film with fully solid-state construction: bends and folds freely, can be easily patterned, and is safer than conventional electrochemical construction

Application

Flexible Power sources for flexible, portable and wearable devices, e.g. LED display, wearable sensors

Award

2018 TechConnect Global Innovation Award (May 2018)



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