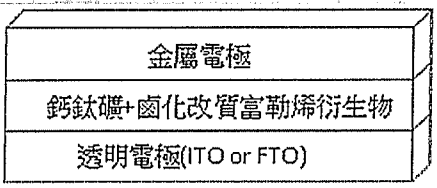
鹵化改質之富勒烯衍生物應用於塊材異質接面鈣鈦礦太陽能電池

發明人：林唯芳 教授
單　位：國立臺灣大學材料科學與工程學系暨研究所



簡　歷：

本團隊目標在於前瞻材料開發，以應用於未來五到十年後電子工業與能源產業所需之材料，團隊介紹如下:

http://www.mse.ntu.edu.tw/~frontier/

市場及需求:

塊材異質接面鈣鈦礦太陽能電池系統是以鈣鈦礦材料與 n 型半導體材料均勻混摻形成光吸收層。如此一來，經光照射的鈣鈦礦材料一旦產生激子，便可有效擴散至鄰近的異質接面而產生電子電洞對分離，進而增加載子的汲取率及鈣鈦礦太陽能電池的光電轉換效率表現。此種元件結構能製備成可撓曲之元件，亦可應用於室內光發電，因此具有極大商業價值。

技術摘要(含成果):

將富勒烯衍生物進行鹵化改質，使其易分散於常用來製備鈣鈦礦元件之溶劑，以增進其與鈣鈦礦材料之混摻性。如此得到之塊材異質接面光吸收層，能有效提升元件之電流表現與光電轉換效率。電流表現相較於未混摻鹵化富勒烯衍生物之平面異質接面結構鈣鈦礦太陽能電池可提高至少兩成，元件光電轉換效率可達 12%以上。

優勢:

我們以鹵化改質富勒烯衍生物作為塊材異質接面混摻之n型半導體材料，此方式可大幅提升富勒烯衍生物在鈣鈦礦層中混摻比例與其分散性，以有效汲取電荷至電極。

競爭產品:

競爭產品為矽晶太陽能電池與 CIGS 太陽能電池。然而矽晶太陽能電池與 CIGS 太陽能電池不具可撓性，且此兩種太陽能電池適用於戶外發電。本產品優勢在於不僅可以製備於可撓曲基板上，亦可用於室內光發電，因此極具商業化價值。

專利現況:

(1)目前暫無相關專利。

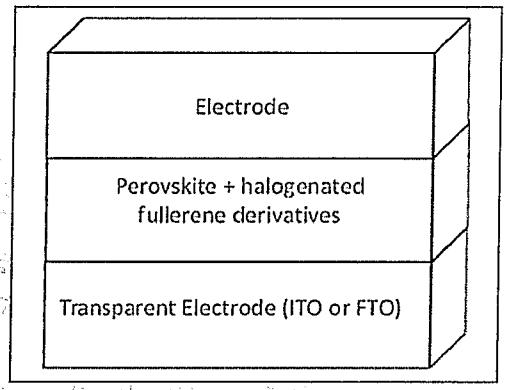
(2)本研究團隊具有數十年研究經驗，我們在奈米材料及元件結構開發有相當豐富的經驗。本專利揭露之技術能有效提升富勒烯衍生物在鈣鈦礦層中分散性及元件表現，相較於現有技術而言，是一重大技術突破。

聯絡方式(請不用填):

臺大產學合作總中心
Tel: 02-3366-9945, E-mail: ntuciac@ntu.edu.tw

Utilize halogenated fullerene derivatives in bulk heterojunction perovskite solar cell device

PI：Prof. Su, Wei-Fang
Department of Materials Science and Engineering, National Taiwan University.



Experience:

Our team focuses on the development of frontier material, which can be applied in electrical and energy industry in the next generation. Following website is the introduction about our team.
http://www.mse.ntu.edu.tw/~frontier/

Market Needs:

The bulk heterojunction perovskite solar cell system is to blend the perovskite material and n-type semiconductor material uniformly to form light harvesting layer. Once light illuminate on the perovskite solar cell and generate the excitons, the excitons can effectively diffuse to nearby heterojunction and dissociate to the free electrons and holes, which can significantly improve the power conversion efficiency of the devices. This kind of device structure has the ability to be processed on flexible substrate and can be applied in the in-door light generating electricity, which shows extremely high economic commercial value.

Our Technology:

The halogenated fullerene derivatives are easy to dissolve in the widely-used processing solvent of perovskite. Our new device structure shows the current density improvement at least 20% and the power conversion efficiency can achieve above 12% compared with the device without blending halogenated fullerene derivatives.

Strength:

We utilize the halogenated fullerene derivatives as n-type semiconductor material blending with perovskite to form the bulk heterojunction layer. This technique can significantly increase the blending ratio of halogenated fullerene derivatives with perovskite material.

Competing Products:

The competing products are silicon-based solar cell and CIGS solar cell. However, silicon-based or CIGS solar cell do not have the flexibility and only can be used in out-door light electricity generation. Our invention of bulk heterojunction perovskite solar cell has the advantages that we can process on the flexible substrate. Also, it can be used in the in-door light electricity generation, which has very high potential to commercialization.

Intellectual Properties:

(1) There is no relative patent now.

(2) Our team has over ten year experiences on the development of nanomaterial and device structure. This patent reveal the technique which is utilize the new halogenated fullerene derivatives as n-type semiconductor material blending with perovskite material to fabricate the bulk heterojunction light harvesting layer. This invention can significantly improve the device performance. Compared with current technique, this invention is a significant breakthrough.

Contact (do not need to fill out):

Center for Industry-Academia Cooperation, NTU
Tel: 02-3366-9945, E-mail: ntuciac@ntu.edu.tw