出國報告（出國類別：其他）

2013 年可撓式與印製電子國際研討會(ICFPE2013)出國報告

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派赴國家：南韓
出國期間：102 年 9 月 10 日~102 年 9 月 14 日
報告日期：102 年 10 月 14 日

摘　要

軟性與印製電子國際研討會（International Conference on Flexible and Printed Electronics, ICFPE）爲一年一度國際可撓式元件應用及設備技術國際會議，由韓國、日本與台灣共同發起，自2009年舉辦首屆會議以來，都是在這三個國家或地區輪流舉辦。本年度的ICFPE在韓國舉辦，會中之研討主題領域包含材料特性、製程設備與技術等，所發表之研究論文涵蓋理論與實務應用，層面廣泛且多樣。演講內容則包含目前最前瞻的研究領域及研究成果，如元件設計、應用及新材料製備技術與展望等，皆爲可撓式光電及節能科技中最前瞻的發展。本次參與ICFPE 2013會議，對於本所瞭解電漿技術應用於可撓式能源及節能等研究領域提供更多最新國內外研發現況、市場及未來發展方向。

目　　次

一、目　的

參加2013年軟性與印製電子國際研討會（ICFPE 2013）並發表電致變色薄膜研發成果論文。研討主題以可撓式薄膜元件技術爲主軸，包含目前最新發展之元件、材料、製程與設備技術。此會議爲可撓式光電業者每年一度最重要之會議，所發表之論文與論壇皆爲目前世界上最新技術及應用發展。由於光電科技產業技術於製程及設備的使用上具有相當高的同質性，對於實現可撓式節能薄膜元件製程可行性方面之相關研發技術及材料具有高度的相似性，包含大面積化均勻鍍膜及製程等技術，於技術研發的藍圖上具有極高的一致性。而可撓式節能薄膜應用於電子產品或建築物上亦是另一股新興的發展趨勢，輕薄可撓的節能薄膜的引入，預期將會加速節能概念融入現有電子產品及建築物。其中，可撓式類紙化產品的研發關鍵，皆以適用於可撓式基板之電漿鍍膜設備爲其關鍵核心技術。近來更有許多可撓式薄膜太陽能電池與光電科技產業結合之相關節能應用的概念論文及產品被提出。本所電漿在綠色節能環境之開發與應用計畫，已規畫發展大面積高速率可撓式節能薄膜整合製程及相關工業型裝置，並深入評估以可撓式節能薄膜與相關節能應用整合。希望藉由參與此技術研討會，獲得更多可撓式製程技術資訊及相關發展方向，並與各國頂尖專家交流，加速本所在可撓式製程設備技術之開發及應用，更藉由本組可撓式電致變色薄膜研發成果論文「The development of flexible solid state electrochromic device for bypass battery application」於可撓式相關之國際會議的發表，提升本所於可撓式節能薄膜元件及設備研發之國際能見度。

二、過　程

本次公差之行程如下：

9 月 10 日　10:05 自桃園國際機場出發，當地時間 9 月 10 日 12:50 時抵達韓國濟州島機場。並於當日 14:30 自濟州島機場搭乘機場巴士至濟洲島會議地點新羅飯店，15:30 抵達飯店，並完成會議註冊程序。

9 月 11 日~ 9 月 13 日　參加 2013 年軟性與印製電子國際研討會並參加演講及蒐集資研發資料。

9 月 14 日　當地時間 11:00 由新羅飯店出發搭乘機場巴士至濟洲島國際機場，抵達濟洲島國際機場時間爲 12:00。並於 13:40 自濟洲島國際機場出發，14:30 時飛抵達桃園國際機場返回台灣。

三、心　得

會議活動主要是以演講及論文海報的方式呈現，除此之外會場亦有一些材料及設備商的展示，皆爲目前最新的研發技術。開幕會場如圖 1 及 2 所示，會場演講廳總共有 3 個可同時進行，並有一個海報展示會場。與會的人員以日本、韓國及台灣佔大多數，主要的原因爲高科技的光電產業大多以這三個國家爲主。

圖 1、2013 ICFPE 研討會開幕會場

圖 2、2013 ICFPE 研討會 Poster 及晚宴會場

本次研討會有論文發表與海報展示，每天會議從上午八點開始安排到下午六點，每一時段有不同的主題，分別在5個不同會議室同時進行。本次會議之主題爲International Conference on Flexible and Printed Electronics，會議時程如圖3所示，共有16國超過900多名科學家、學校教授、研發單位、工業代表、政策決策者參與會議，總計發表423篇技術研發技術論文，展示研發成果，如圖4所示。

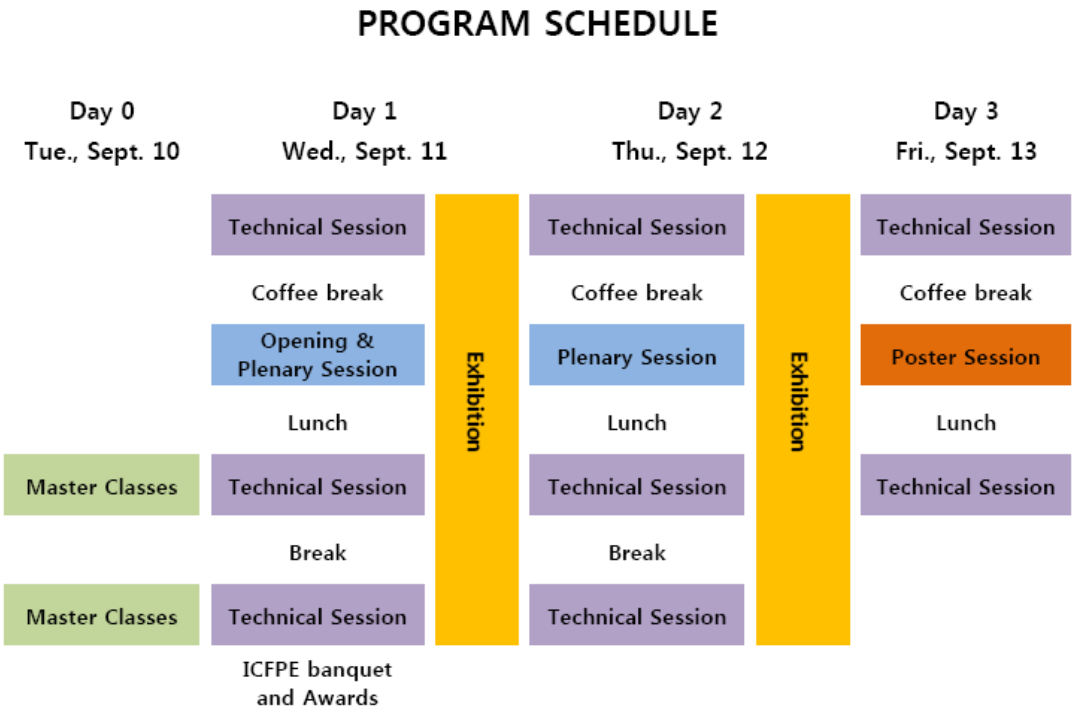


圖 3、2013 ICFPE 研討會會議時程

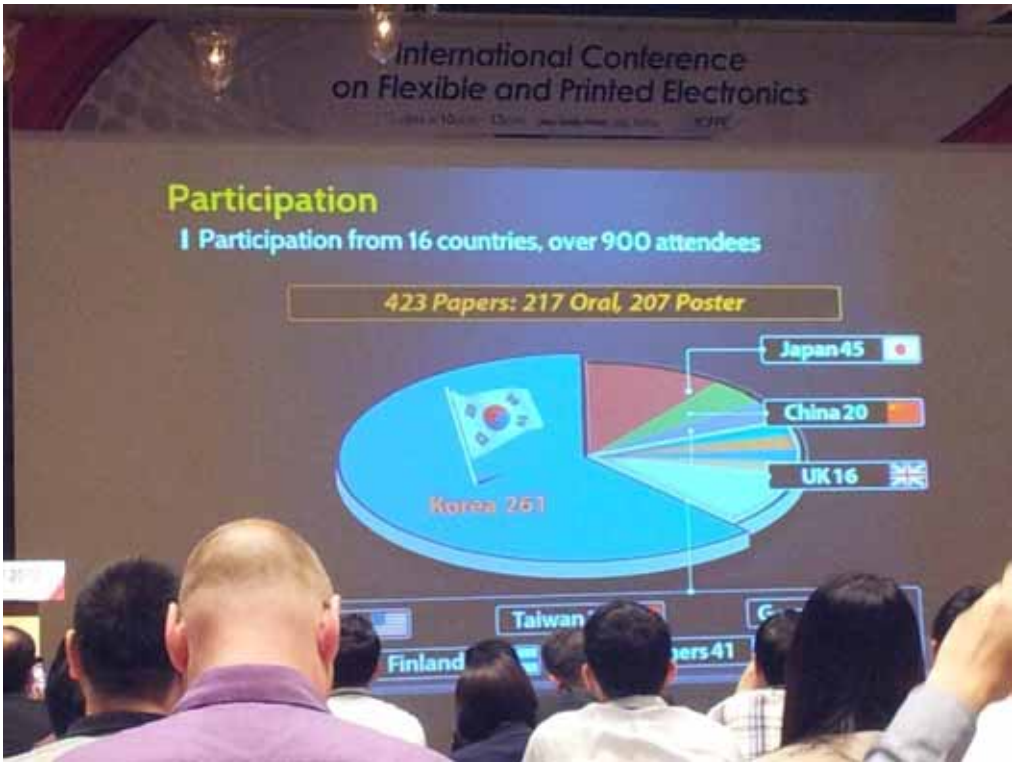


圖 4、2013 ICFPE 研討會與會人數及論文發表統計

相關之會議資料如下所列，圖 5 爲現場韓國顯示器大廠 LG Display 所展示之製程設備海報，主要分爲四大部分，分別爲 R2R 圖案化設備技術，主要用於薄膜圖形圖案化之應用，幅寬爲 400mm，採用壓印技術(Imprint)達成圖案化效果；第二部分則是 R2R 電漿濺鍍技術，主要用於鍍製金屬薄膜及無機材料薄膜，幅寬爲 400mm，採用 DC 及 RF 電漿源技術；而第三部分則爲 R2R 濕式製程技術，主要用於金屬蝕刻及光阻樹脂去除，幅寬爲 400mm，搭配清洗系統及大氣電漿技術(AP Plasma)；第四部分則是尚在開發之 R2R 電漿輔助化學氣相沉積(CVD)及乾式薄膜蝕刻(Dry Etch)系統，主要用於半導體、絕緣層之沉積與蝕刻製程。因此，由此設備發展趨勢及開發之難易度關鍵來看，R2R 電漿輔助化學氣相沉積(CVD)系統仍將是此連續鍍膜製程能否成功之關鍵技術。

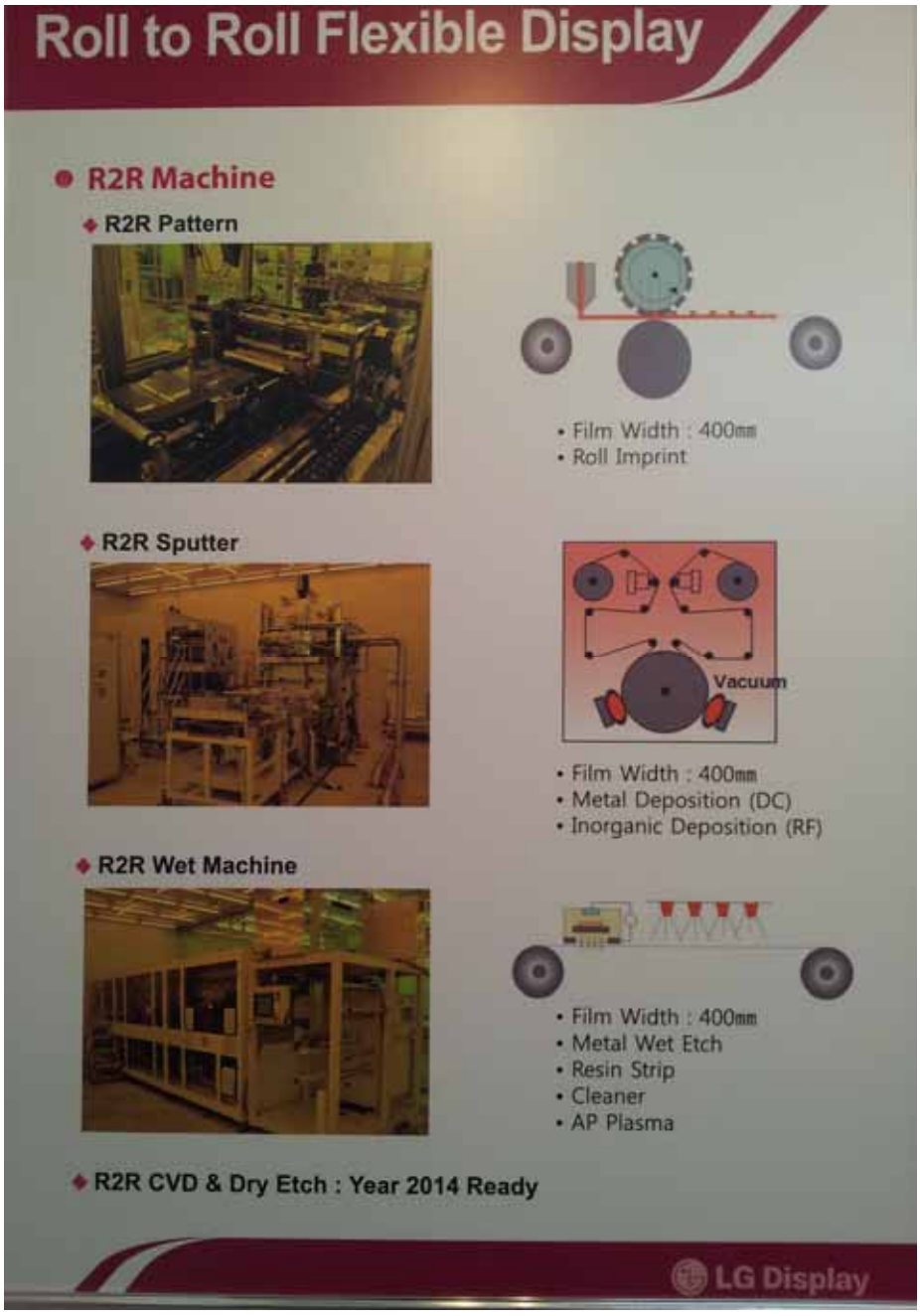


圖 5、韓國顯示器大廠 LG Display 所展示之製程設備海報

圖 6~圖 10 爲三星電子根據可撓式顯示器所提出之解決方案，由塑膠基板端即投入設備及製程開發，前段製程以 R2R 加熱、電漿表面處理及濺鍍方式針對塑膠基板進行前處理。值得注意的是塑膠基板在顯示器製程的部份，採用的是裁切後再與玻璃進行貼合的製程，此製程的引入對於原有設備而言，雖具有不需更改現有製程設備的優勢，但關鍵技術將落在塑膠基板本身之收縮特性及貼合之平整度。因此必須開發低溫顯示器元件製程，以符合後續塑膠基板特性之製程技術，與 R2R 直接濺鍍或電漿沉積薄膜方式相較，具有許多難題需要克服。國內因長期缺乏此類設備開發經驗，導致主要設備技術仍掌握在國外，並只能以國外現有設備開發元件製程技術，導致整體光電產業於 R2R 製程開發進度緩慢，且製程可調變性不高。

圖 6、三星電子根據可撓式顯示器所提出之解決方案-塑膠基板製作模組

圖 7、三星電子根據可撓式顯示器所提出之解決方案-塑膠基板阻氣層模組

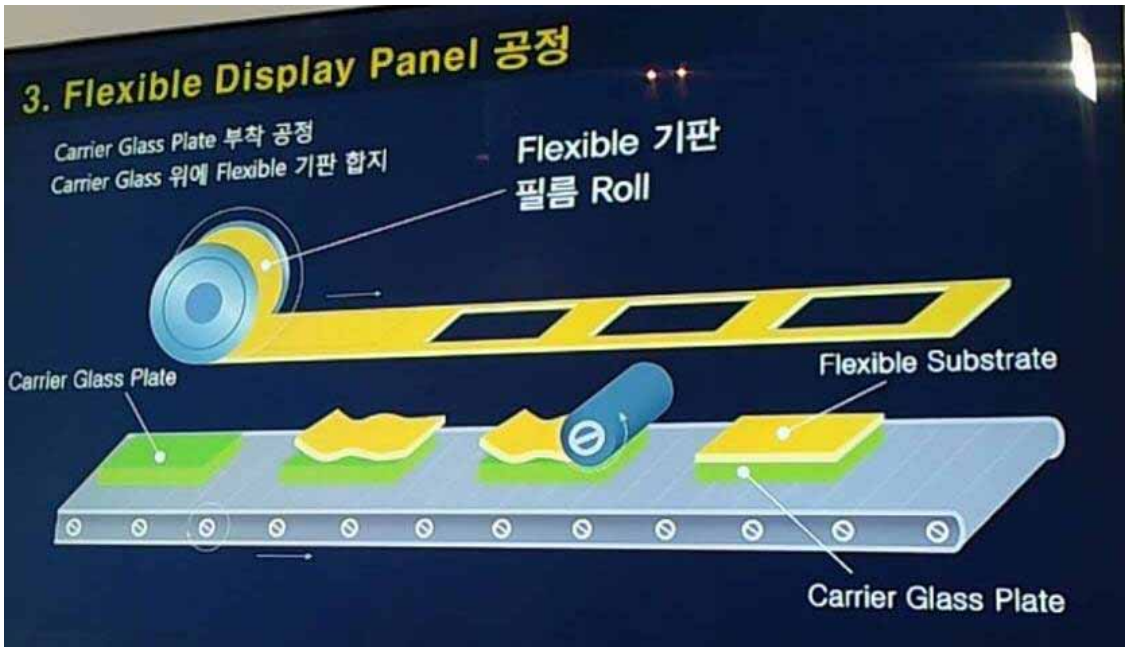


圖 8、三星電子根據可撓式顯示器所提出之解決方案-可撓式基板貼合模組

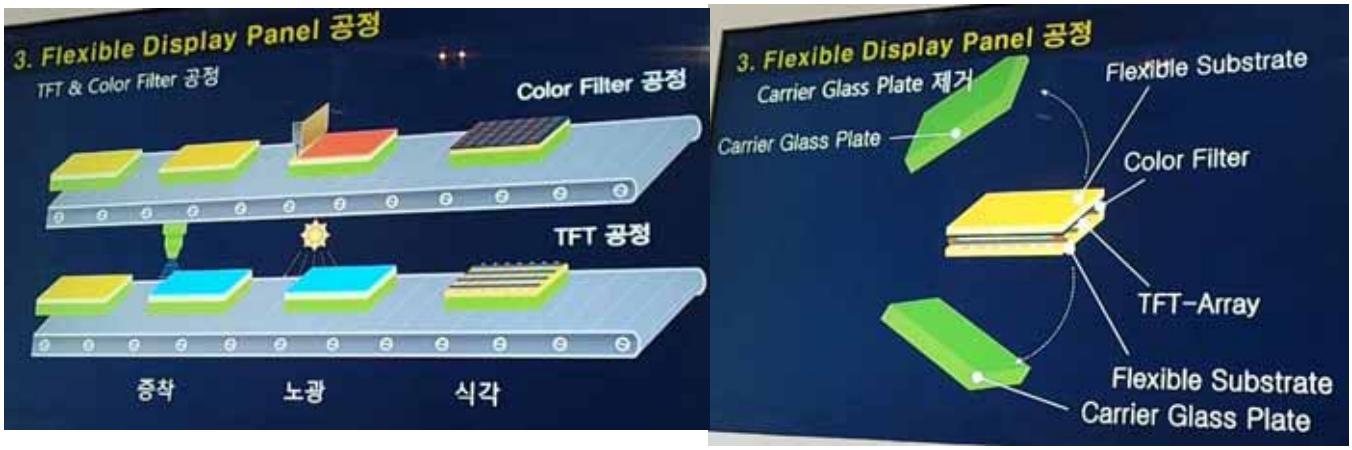


圖 9、三星電子根據可撓式顯示器所提出之解決方案-可撓式顯示器製程模組

圖 10、三星電子根據可撓式顯示器所提出之解決方案-可撓式顯示器應用領域

圖 11 爲日本印刷電子協會可撓式電子元件及印刷電子元件技術之研究方向，內容包涵顯示器、感測器、觸控面板及薄型電池等應用。製程設備發展方向以節能、高速、小尺寸、低能量驅動爲主軸，並達成連續性製程、較短的製程時間及大面積化爲目標。而針對元件應用方面則以輕、薄、不易破碎、形狀多元化應用爲主軸，再藉由技術整合及量產技術研發達成上述目標，可作爲我國後續可撓式電子及設備發展之參考目標。

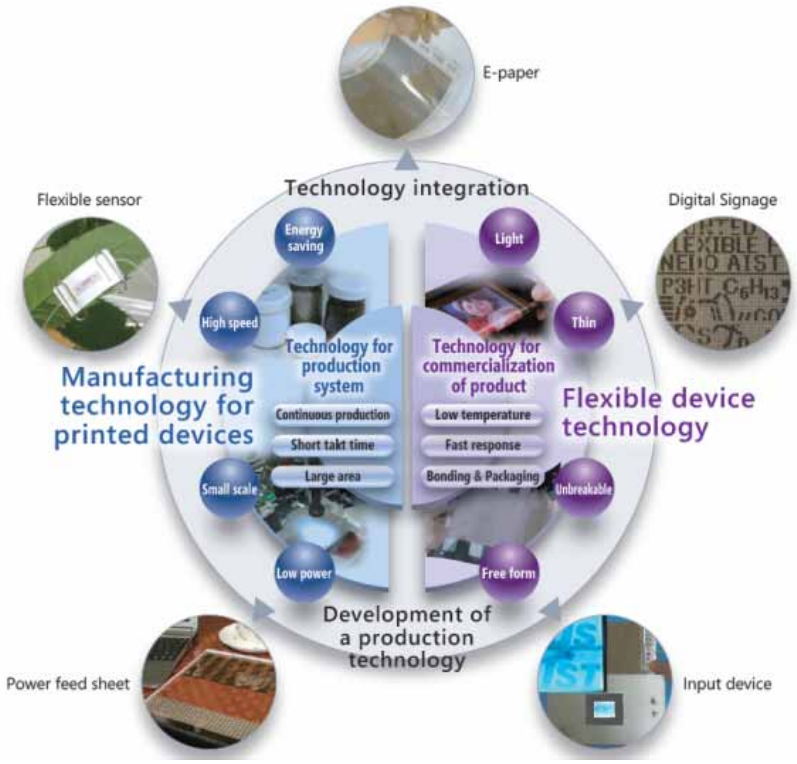


圖 11、日本印刷電子協會可撓式電子元件及印刷電子元件技術之研究方向

圖 12 爲英國列印電子中心針對 R2R 製程設備的設計所提供之建議，以往皆以從頭到尾連線化的方式進行設計，但遭遇到各個膜層不同的鍍膜速率及處理時間的差異問題，由於不同製程必須相互配合，導致整體 R2R 製程效率不佳，因此英國列印電子中心提出以模組化 R2R 的方式，來有效避免上述的製程問題，可作爲我國發展 R2R 製程設備之參考依據。

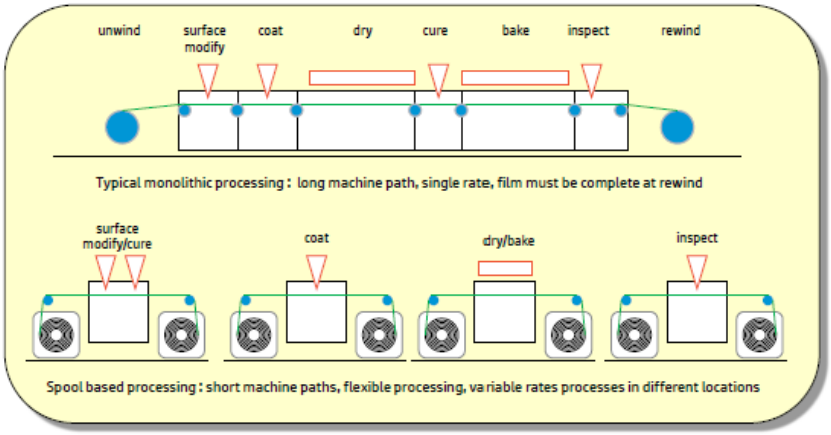


Fig. 2 Modular approach via cassette (bottom) vs monolithic film handling techniques (top)

圖 12、英國列印電子中心針對 R2R 製程設備的設計所提供之建議

圖 13 爲透明導電膜應用於觸控面板之最新材料趨勢，其中藉由低成本網印技術所發展之溶液型奈米碳管技術，雖然具有較佳之光學穿透度(＞85%)，但於片電阻值表現上僅接近 280 Ω/□，對於現行觸控面板所需求之片電阻值，仍需持續提昇特性；而 ITO 薄膜若以常用之真空金屬濺鍍製程製作，則可維持光學穿透度(＞80%)及片電阻值接近 100Ω/□的特性，但隨著觸控面板尺寸不斷的擴大，此片電阻值已逐漸無法符合需求。因此目前國外最今趨勢是以金屬化的網格作爲開發重點，其光學穿透度介於 75%~88%之間，片電阻值則介於 0.1Ω/□~30Ω/□之間，但製作網格所需製程技術較爲複雜，大多採用 R2R 系統的微影設備搭配合金屬蝕刻技術來製作，因此成本最高，但爲了達成後續大型觸控面板之需求，此技術仍是較可能商業化之選項。

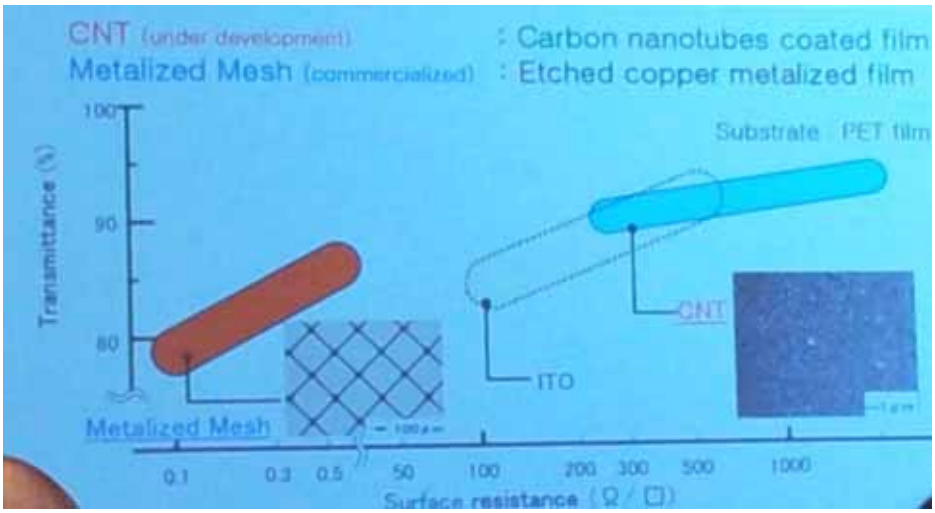


圖 13、爲透明導電膜應用於觸控面板之最新材料趨勢

圖 14 爲不同產業對於可撓式透明導電膜片電阻值之要求，由高而低依序爲觸控面板、智慧窗、可撓式顯示器、可撓式 OLED 面板及可撓式薄膜太陽能電池。但以產品實際需求考量，片電阻值仍是朝低阻值方向發展，舉智慧窗爲例，爲達成低電壓驅動電致變色薄膜元件的需求，對於 30cm×30cm 面積大小的電致變色窗而言，所需片電阻值大小以 10Ω/□以下爲最佳；而針對發電的太陽能電池而言，除了透明導電膜外，更需以銀膠網印方式達成更低電阻值的需求。因此，發展低成本、低阻值及高穿透度的可撓式透明導電極技術仍是主流。

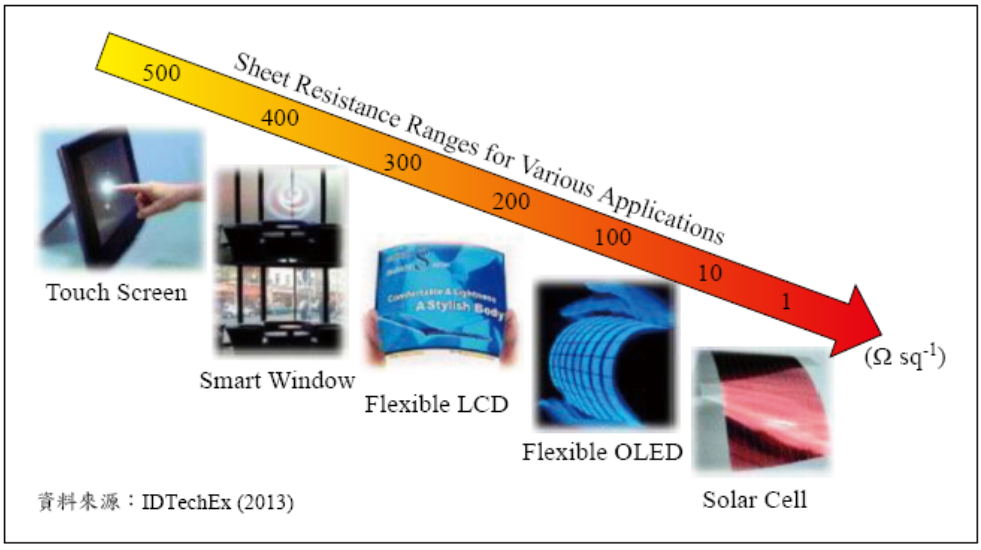


圖 14、不同產業對於可撓式透明導電膜片電阻值之要求

圖 15 爲結合曝光技術於 Roll to Roll 製程製作出透明導電膜技術的方式，主要技術爲在 Roller 中放入曝光光源及圖案化遮罩，其最佳解析度可達 10 μm，穿透度可達 90%，此電極技術可應用於大面積化顯示器之應用，提供現有觸控面板常用之透明導電膜電阻值逐漸無法符合需求之解決方案。

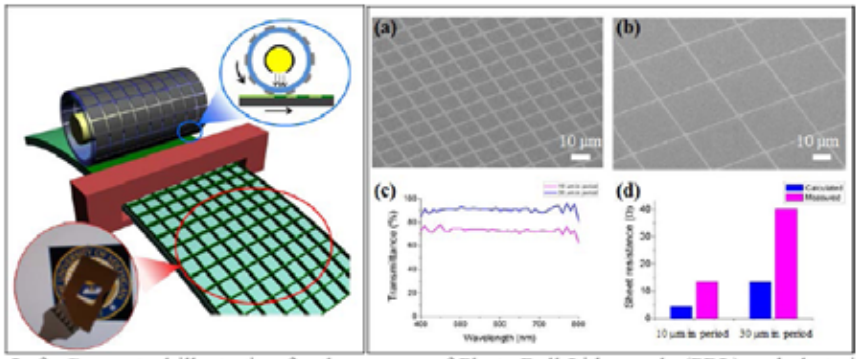


Fig.1. Left: Conceptual illustration for the process of Photo Roll Lithography(PRL) and photo image of transparent metal electrode(red inset) Right: (a) SEM image of metal mesh pattern with 10 μm of period and 1 μm of width. (b) SEM image of TME with 30 μm and 1 μm of period and width. (c) Transmittances of two different periodic samples. (d) Sheet resistances of two samples. Blue bar and scarlet bar indicate calculated values and measured ones, respectively.

圖 15、結合曝光技術於 Roll to Roll 製程製作出透明導電膜技術

圖 16 爲開發奈米碳管合成材料於透明導電膜之應用，藉由不同的分散方式，可應用於現有的光電領域，再搭配網印及印刷的方式可大幅降低成本，並達到所需求之高穿透度。目前市場上已有相關材料商提供應用。

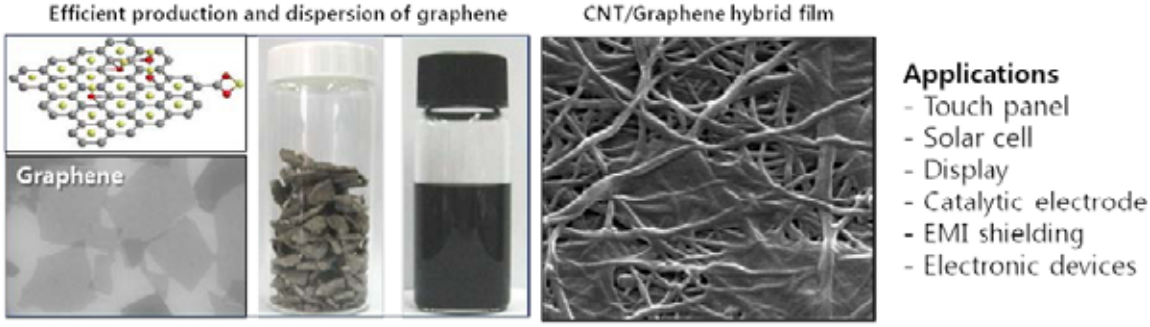


Fig.1 Dispersion of nanocarbon materials in suspension and its applications.

圖 16、奈米碳管合成材料於透明導電膜之應用

圖 17 爲電漿及熱氣裂解的材料合成技術，其中熱氣裂解爲由大到小的裂解方式，而電漿則是由小到大的合成方式，藉由此兩種方式的運用，可合成不同尺寸規格之材料，尺寸範圍爲 0.1 μm~10 μm，以提供不同微電子材料應用之需求。

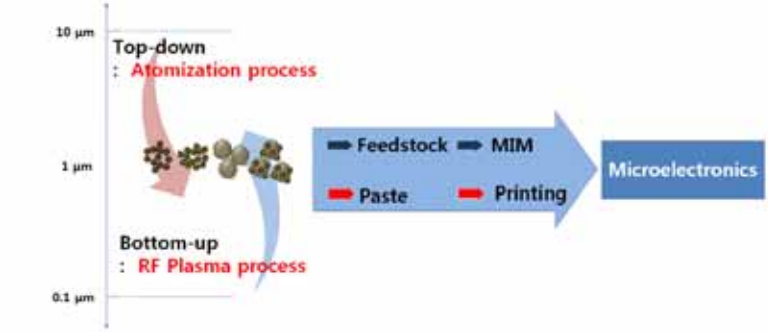


Fig. 1 Hot gas atomization coupled radio frequency plasma process to prepare blank sized (0.1~10 □ m) fine particles and their applications for microelectronics.

圖 17、 藉由電漿及熱氣裂解的方式合成不同尺寸材料技術提供不同應用之需求

圖 18 爲 LG Display 針對顯示器之面板內部與外部連接電路之 30 μm 細金屬線製程所提供之低成本銀膠列印解決方案，並比較現有製程的成本差異。若以三種不同製程來說，線寬 30 μm 爲需求，則網印銀膠技術無法達成此規格；而針對薄膜電阻值而言，現有真空金屬鍍膜及蝕刻製程所達成之薄膜電阻值 1000Ω已符合目前需求，但以銀膠列印的方式則可將薄膜電阻值降低至 300Ω，且製程步驟由現有 9 到製程減至 1 道製程。整體而言，利用銀膠列印的方式，製程步驟可縮減 89%，設備投資縮減 63%，員工投資縮減 54%，設備製程時間縮減 21%，設備等候時間縮減 13%，材料成本縮短 11%。因此採直接銀膠列印的方式可有效降低整體製程成本。

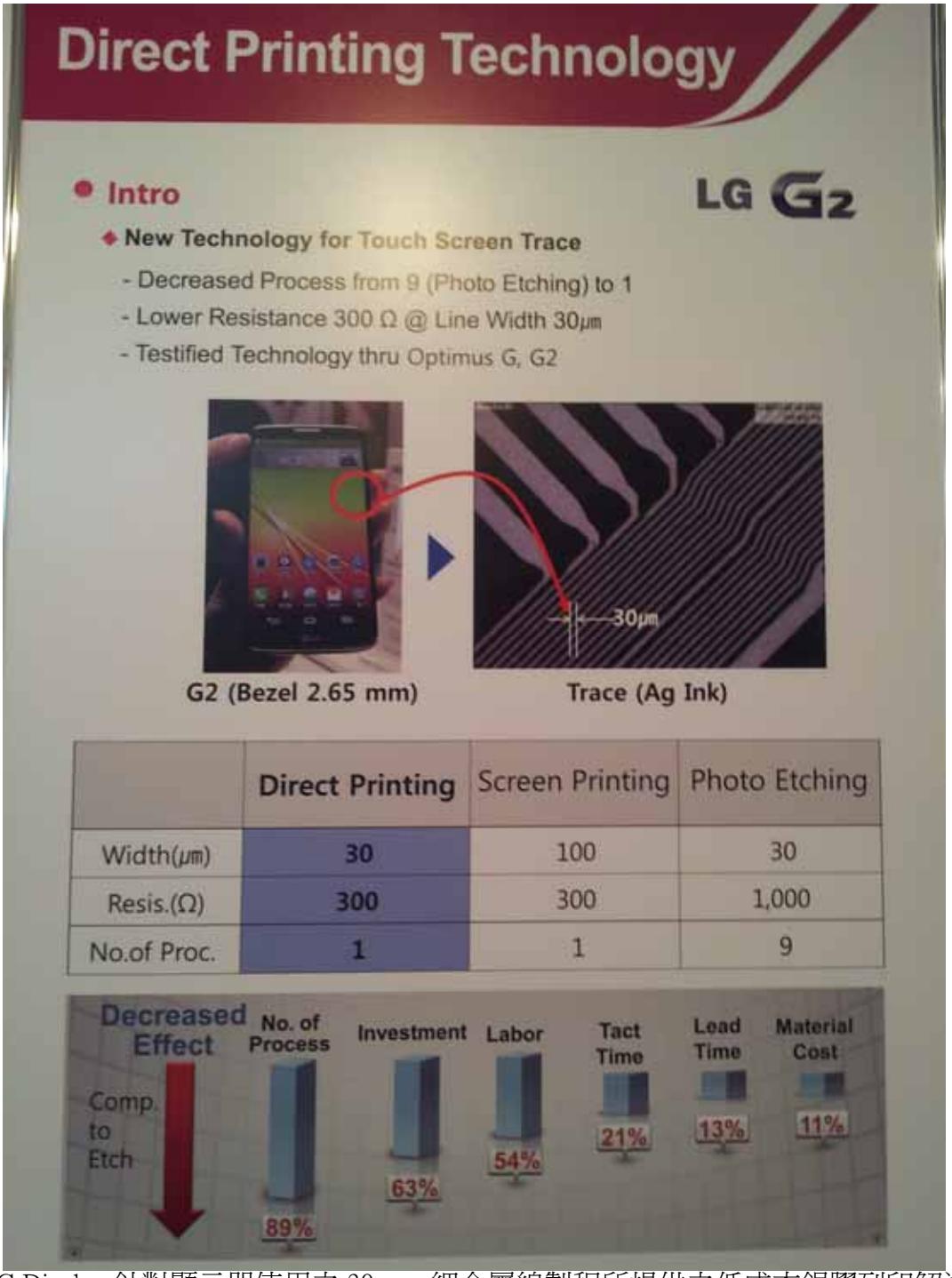


圖 18、LG Display 針對顯示器使用之 30 μm 細金屬線製程所提供之低成本銀膠列印解決方案

圖 19 爲韓國印刷電子中心(KEPC)於會場所展示之研發成果，針對建築物節能應用方面，電致變色智慧窗爲其成果之一。該技術展示 2x2 矩陣之 300mm 的窗戶模組，上下兩層玻璃分別鍍製電致變色薄膜，並以電解質膠體進行封裝的方式組成電致變色模組，再藉由網印的方式在 ITO 玻璃上網印金屬網格，來達成縮短大面積電致變色模組變色時間。 25mm 試製樣品上，可獲得變色轉換時間由 240sec 縮短至 80sec 的元件特性。該計畫所設定之短期目標爲面積 300mm×300mm 之電致變色模組其穿透度變化介於 20%(著色)~75%(退色)之間、變色轉換速度小於 100sec/m^2以及高可靠度之汽車窗戶。長期目標則以薄膜組成之電致變色模組，面積大於 1m^2、製程成本由$ 1000 USD /m^2下降至$ 100 USD /m^2。

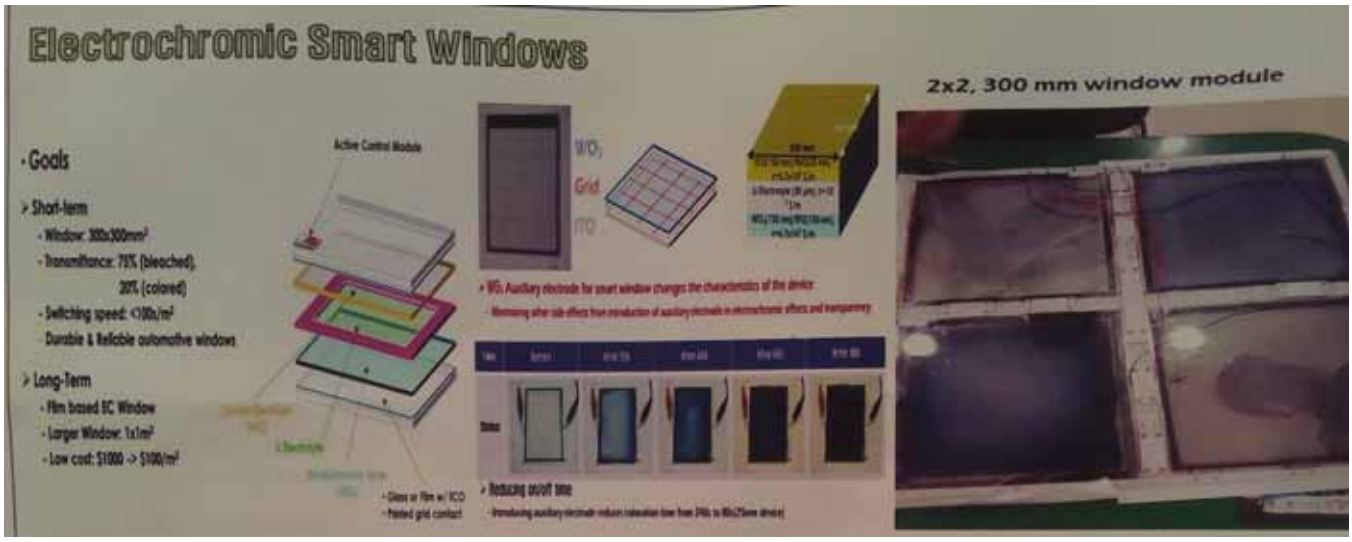


圖 19、韓國印刷電子中心於會場所展示之電致變色窗研發成果

圖 20 爲 Shanghai Normal University 利用 WO_3 在不同 NO_2 的環境下所產生的電阻值的變化，所開發的 NO_2 氣體的偵測器。本研究成果採用便宜的 PI 基板，並藉由列印的技術達成低成本的需求。

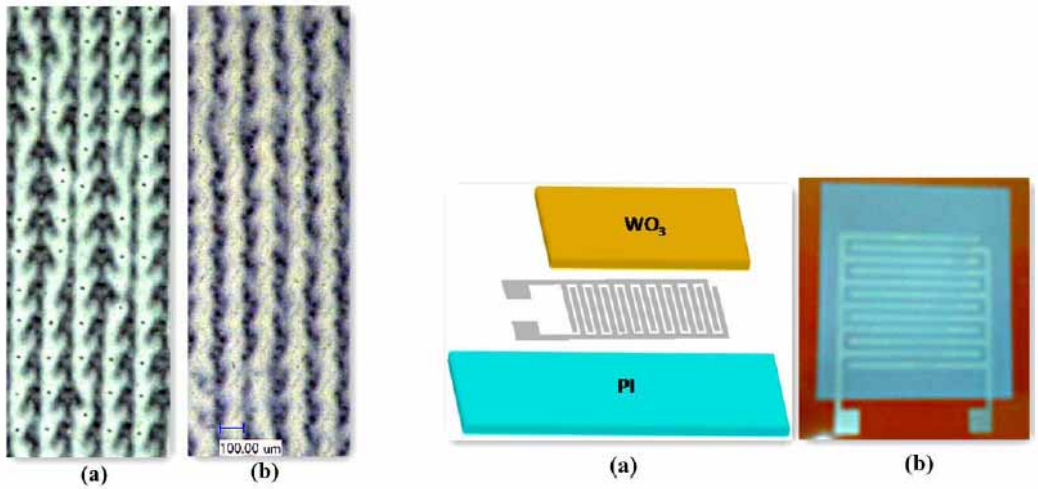


Fig.3 Optical images of the gravure printed WO_3 patterns formed with different printing times (a)1 time and (b) 2 times(printing speed:9m/min)

Fig.4 (a) Schematic showing the structure of gas sensor. (b) fabricated resistive gas sensing device.

圖 20、以 WO_3 薄膜作爲 NO_2 氣體的偵測器

圖 21 爲韓國印刷電子中心(KPEC)於會場所展示之研發成果，針對薄膜儲能應用及研發方面，展示可撓式薄膜鋰電池研發成果，主要仿照電致變色元件組成方式開發膠態電解質，並藉由封裝方式組成可撓式薄膜鋰電池，顯示本項關鍵技術仍在於鋰離子膠態電解質之開發。

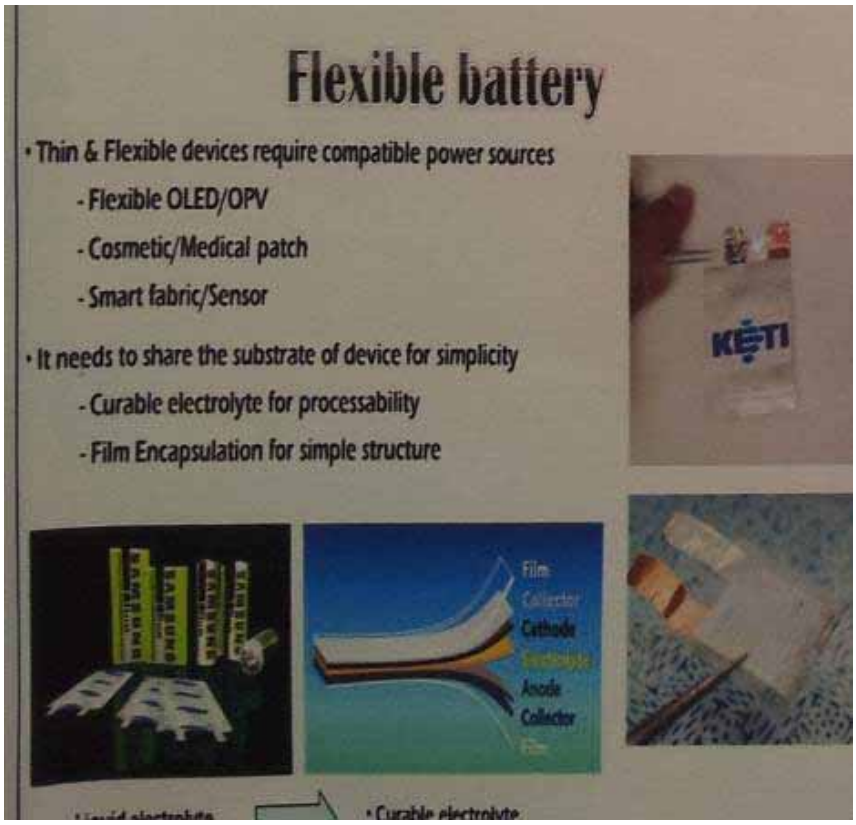


圖 21、韓國印刷電子中心(KPEC)於會場所展示之薄膜儲能應用及研發成果

圖 22 爲南韓 Sunchon Nat'l Univ 所發表之可撓式薄膜電池元件製作方式，主要藉由在 PET 塑膠基板上製作電極，並依序插入 Zn/Polymer Electrolyte/MnO2 材料完成可撓式電池製作，圖左爲一次電池之元件結構，圖右展示此電池提供 LED 燈炮用電。此製程方式簡單，可作爲我國後續發展可撓式電池之參考。

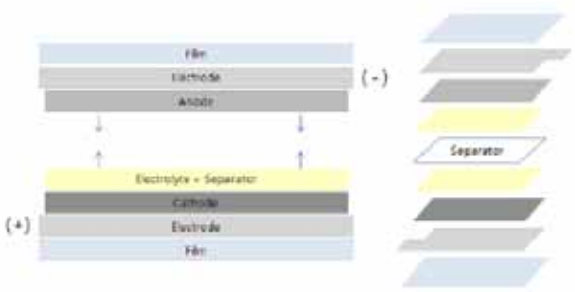


Fig.1 Schematic diagram of printed primary batteries

Fig. 2 Photo showing LED lamp-on with printed primary battery

圖 22、南韓 Sunchon Nat'l Univ 所發表之可撓式薄膜電池元件製作方式

圖 23 爲鋰電池之電及材料發展趨勢及市場估計，圖 24 則爲南韓 Sungkyunkwan Univ 針對鋰電池正極之電極材料以電漿濺鍍方式開發矽薄膜合金電極，由於先前矽合金材料雖然擁有高電荷容量，但由於充放電時體積變化過大導致可靠度不佳，本篇研究以濺鍍方式製作之矽合金電極則具有較佳之可靠度，充放電特性可提升至 100 次以上，並維持 97%以上之電容量。

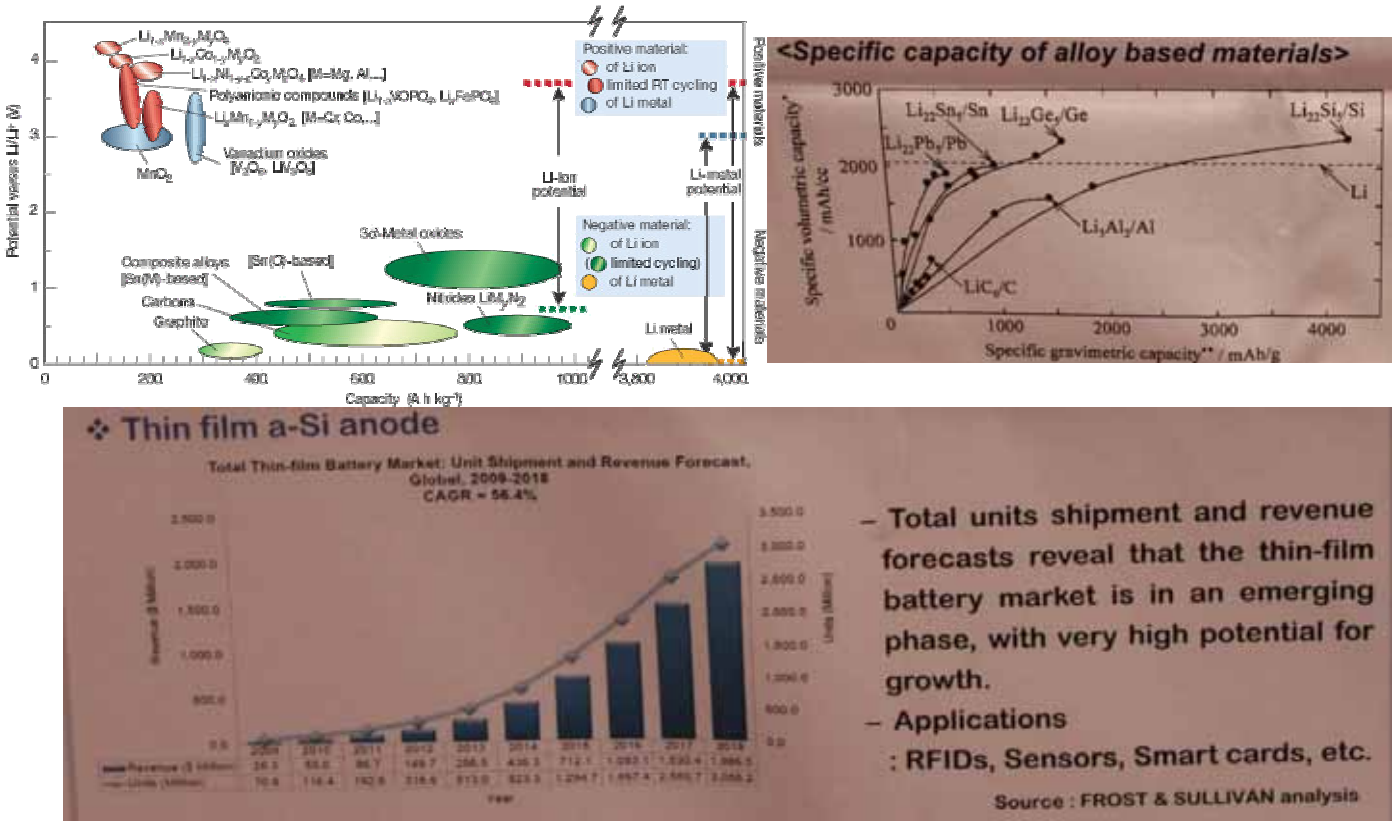


圖 23、鋰電池之電及材料發展趨勢及市場估計

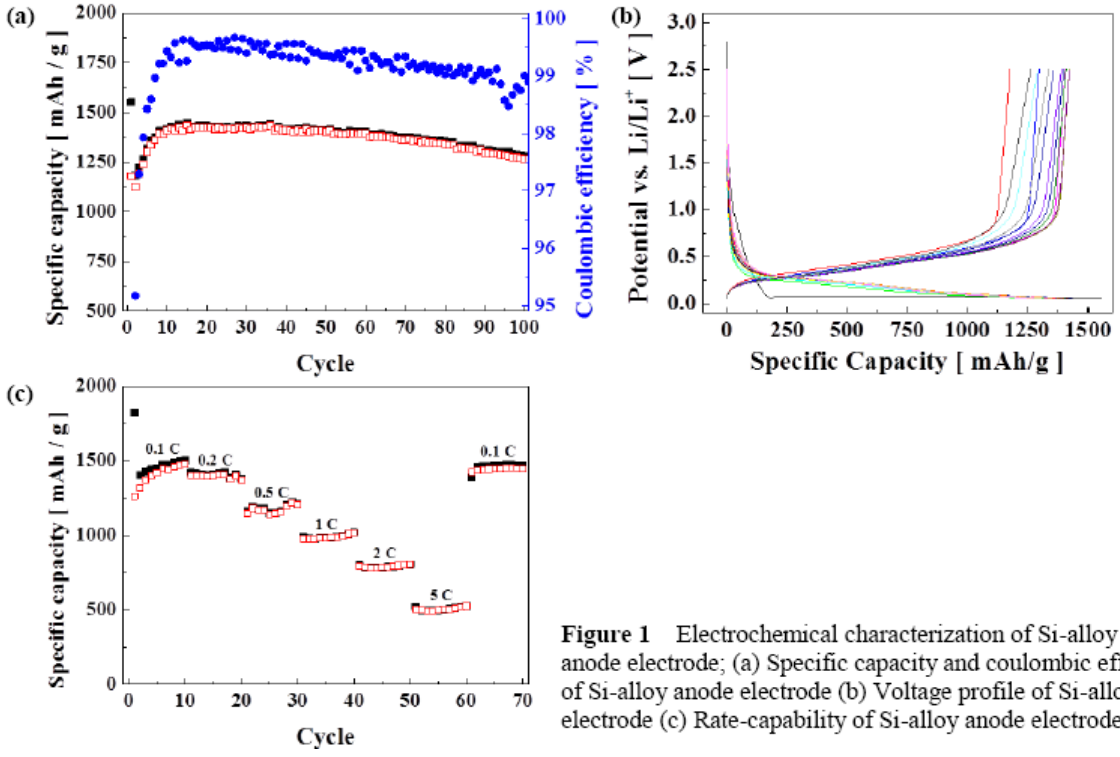


Figure 1 Electrochemical characterization of Si-alloy thin film anode electrode; (a) Specific capacity and coulombic efficiency of Si-alloy anode electrode (b) Voltage profile of Si-alloy anode electrode (c) Rate-capability of Si-alloy anode electrode

圖 24、藉由電漿濺鍍方式開發矽薄膜合金鋰電池正極電極

圖 25 爲國外知名市場分析公司 IDTechEx 針對有機太陽能電池之成本效益進行成本分析之結果，預估在轉換效率達 10%時，有機太陽電池成本將可降至$USD1.6/Watt，但其中有機太陽能電池材料佔比高達 49%、基板材料成本占比約 23%(含阻擋層) 、透明導電膜佔比 26%，顯示有機太陽能電池開發關鍵技術仍在於太陽能電池有機半導體材料之合成與開發。

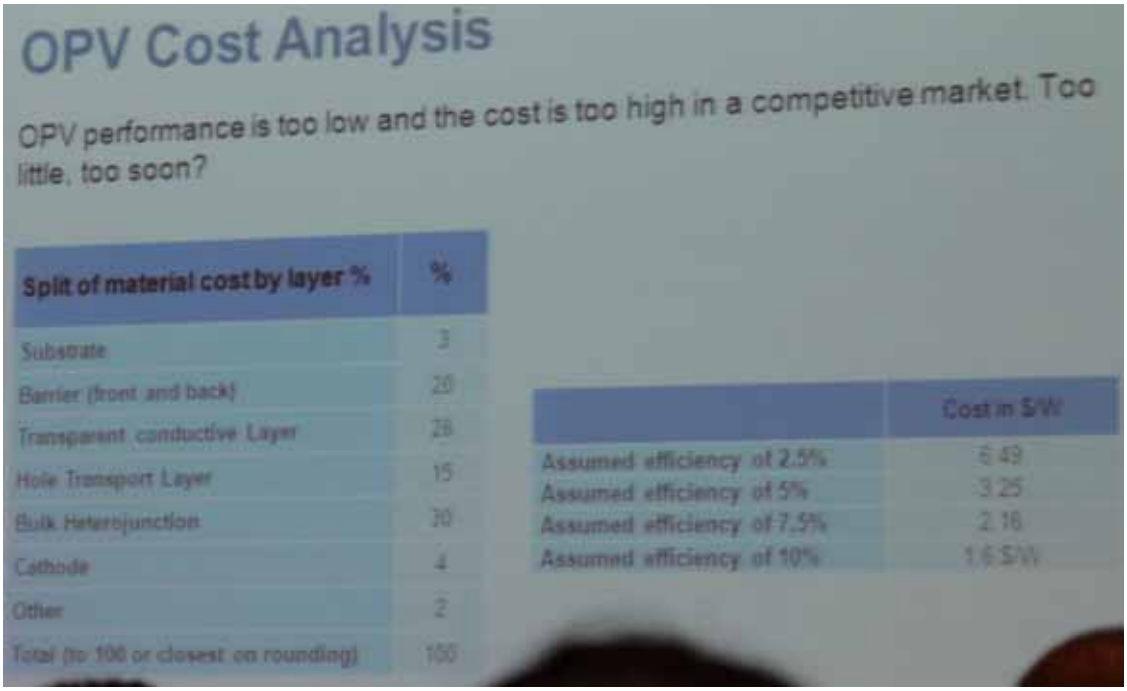


圖 25、國外知名市場分析公司 IDTechEx 針對有機太陽能電池之成本分析

圖 26 爲國外知名市場分析公司 IDTechEx 針對銀膠於不同市場之佔比分析，包含太陽能、感測器、汽車領域、ITO 取代、智慧包裝等領域，可以發現目前主要市場仍是以太陽能爲主，市場佔比高達 9 成，後續特領域應用之發展仍待觀察。

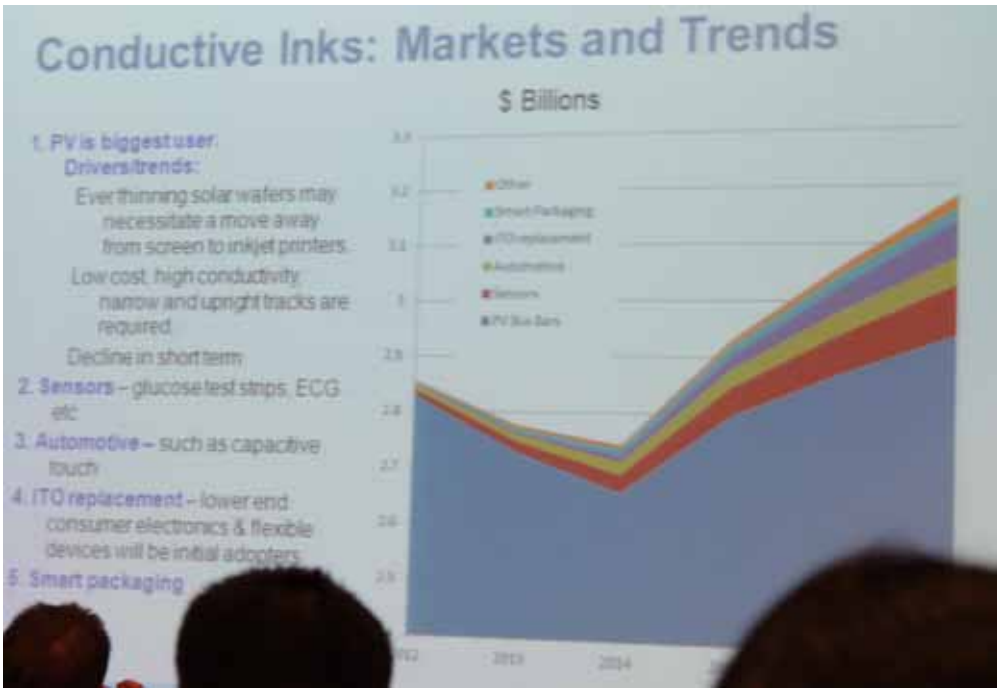


圖 26、國外知名市場分析公司 IDTechEx 針對銀膠於不同市場之佔比分析

圖 27 爲國外知名市場分析公司 IDTechEx 針對銀膠於太陽能電池應用之技術進行介紹，爲了有效減少銀膠的用量，採用二次塗佈的方式不僅提高金屬導線高寬比(Aspect ratio)，並可將線寬由原本 140 μm 縮減至 70 μm 以下甚至 40 μm，有效節省銀膠用量，降低整體製程成本。

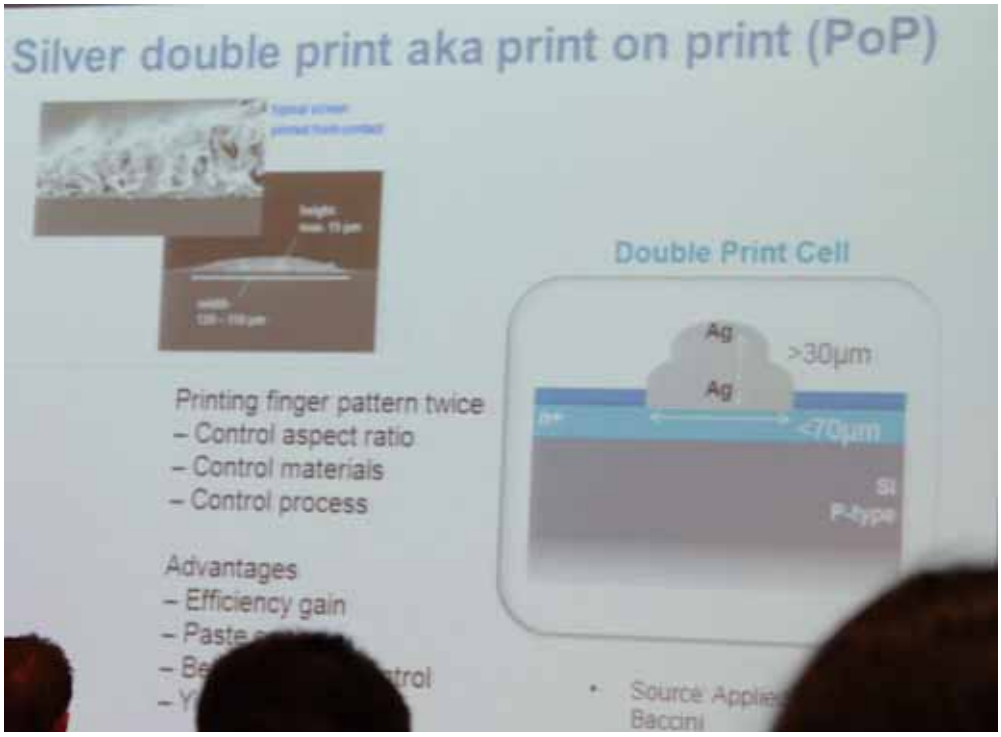


圖 27、國外知名市場分析公司 IDTechEx 針對銀膠於太陽能電池應用之技術進行介紹

圖 28 爲降低銀膠與太陽能電池接觸阻值的方案，先前的方式以引入一層中間層方式來達成，如高摻雜層或是電鍍鎳層來降低銀膠與太陽能電池接觸阻值，韓國的 Pukyong National University 藉由在銀膠內添加有機銀，可有效於 750℃ 降低銀膠與太陽能電池接觸阻值。

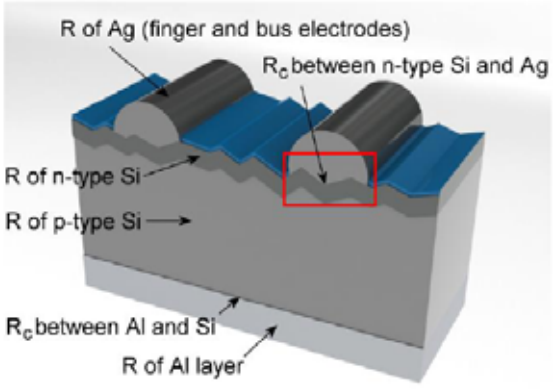


Fig.1 Major series resistance components of a Si solar cell.

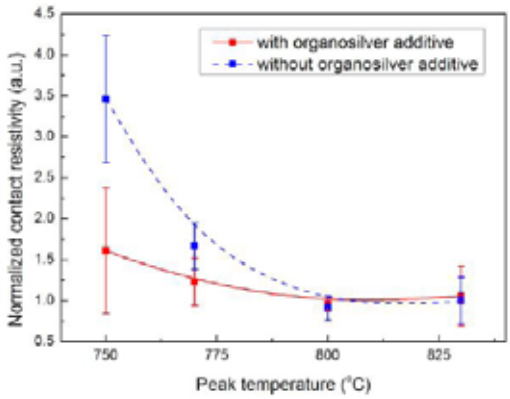


Fig.2 Impact of organosilver additive on specific contact resistance of a Si solar cell.

圖 28、降低銀膠與太陽能電池接觸阻值的方案

圖 29 爲國外知名市場分析公司 IDTechEx 針對高效率太陽能電池技術引入矽墨水所進行的製程及太陽能電池特性說明，藉由矽墨水製程的引入，提供簡易的選擇性射極型成技術，可增加太陽能電池短波長的吸收，主要的原因爲選擇性設計技術可有效減少短波長光因太陽能電池高濃度摻雜所產生之能隙(Energy Bandgap:Eg)降低效應，讓短波長之光更有效率通過太陽能電池表面形成光電流。如圖 30 所示，爲傳統太陽能電池技術與選用選擇性射極的技術之比較，可以發現選用選擇性射極的技術，可將太陽能電池光電轉換效率由 18%提升至 18.8%

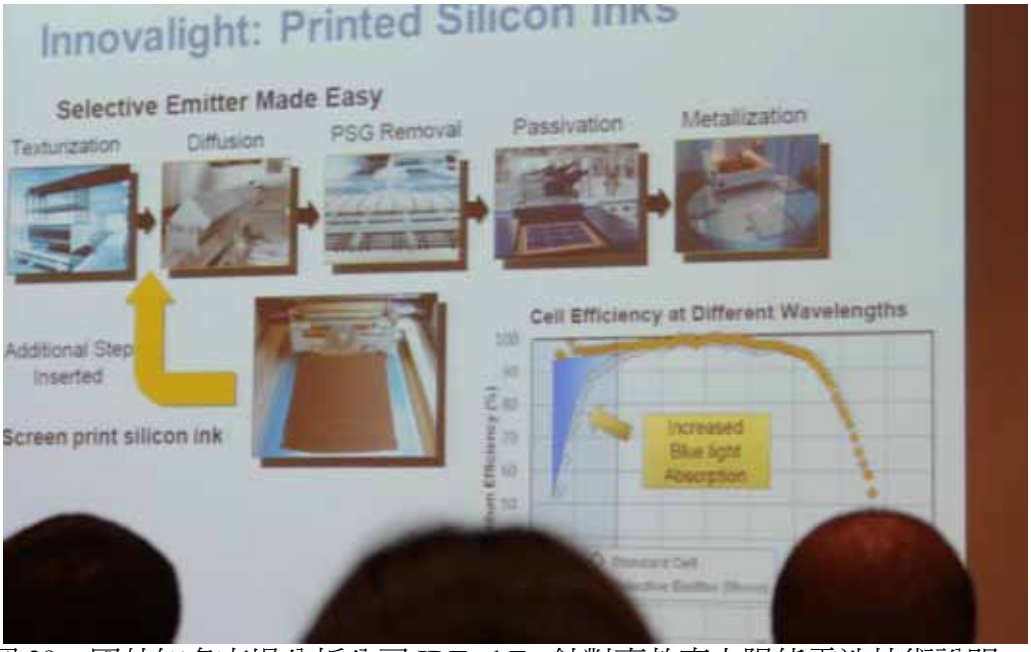


圖 29、國外知名市場分析公司 IDTechEx 針對高效率太陽能電池技術說明

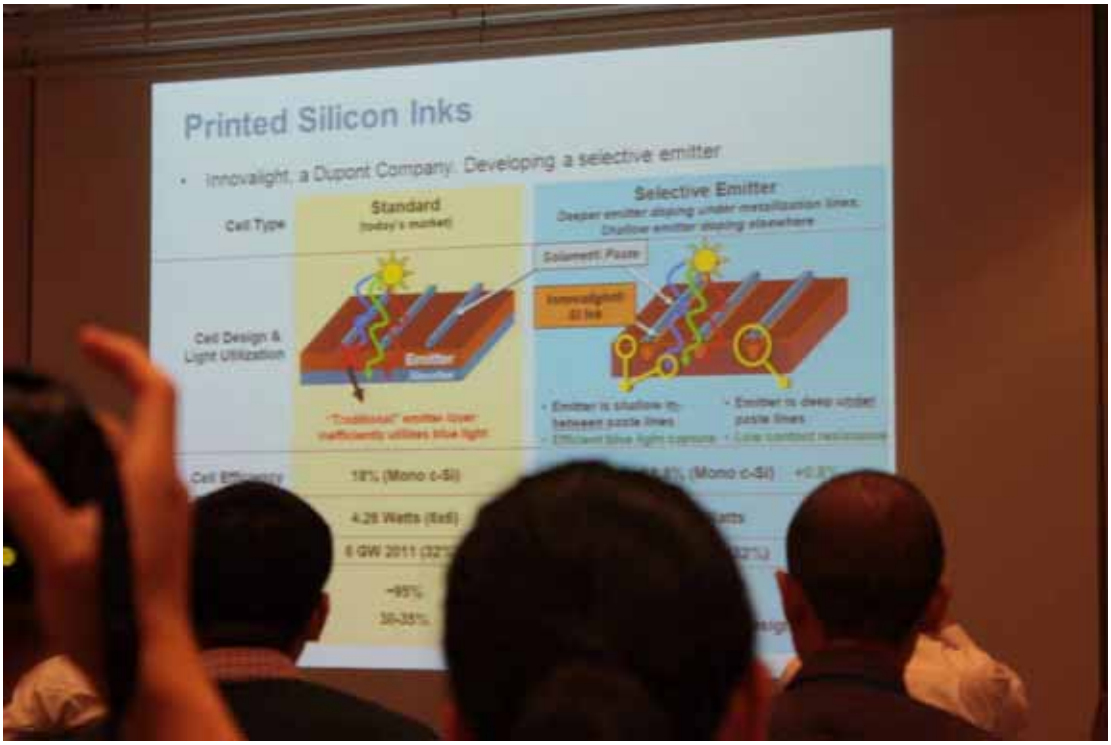


圖 30、傳統太陽能電池技術與選用選擇性射極的技術之比較

圖 31 爲台灣明新大學針對電漿共濺鍍透明半導體 IGZO 薄膜之研發內容，主要是以電漿共濺鍍的方式來製作透明半導體，以作爲顯示器元件之半導體層。研發中顯示藉由改變 Ga_2O_3 之電漿鍍膜功率可調整透明半導體薄膜之載子濃度及載子移動率，並以此透明半導體膜成功製作薄膜電晶體元件，量得薄膜電晶體元件電特性。

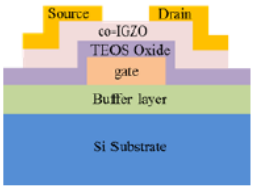


Fig. 1 The cross-sectional view of the fabricated co-sputtering IGZO TFTs device

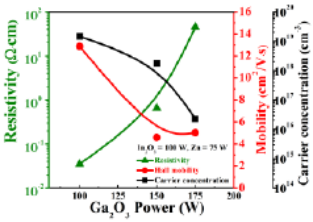


Fig. 2 Hall measurement plot of co-sputtering IGZO films as a function of deposition power of Ga_2O_3.

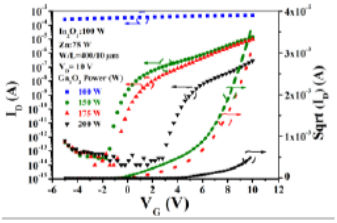


Fig. 3 $I_D - V_G$ transfer characteristics of co-sputtering IGZO TFTs (W/L=400 μm /10 μm) at V_D=10 V

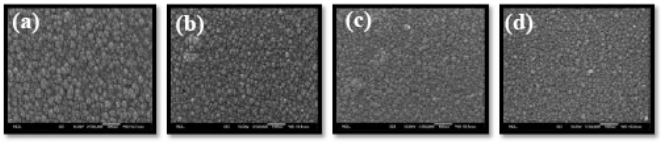


Fig. 4 SEM graphs of co-sputtering IGZO films with the deposition powers of Ga_2O_3 at: (a) 100 W (b) 150 W (c) 175 W and (d) 200 W, respectively.

圖 31、台灣明新大學針對電漿共濺鍍透明半導體 IGZO 薄膜之研發內容

圖 32 爲南韓三星電子針對奈米銀粒子應用於量子點發光元件所發表之研究，主要是藉由奈米銀粒子與 TiO_2 之多層結構所產生之表面電漿子效應提昇量子點發光元件之發光效率，研究結果顯示雙層奈米銀粒子與 TiO_2 結構可獲得最佳之光電特性提昇。

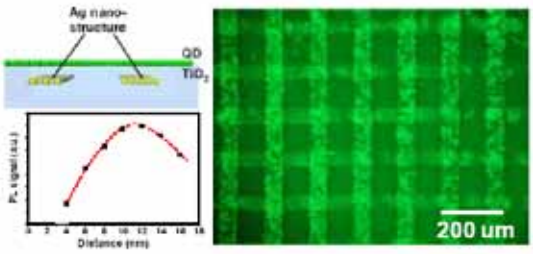


Fig.1 PL intensity of QD/TiO_2/Ag nanostructure according to thickness of TiO_2 film and a fluorescent microscope image.

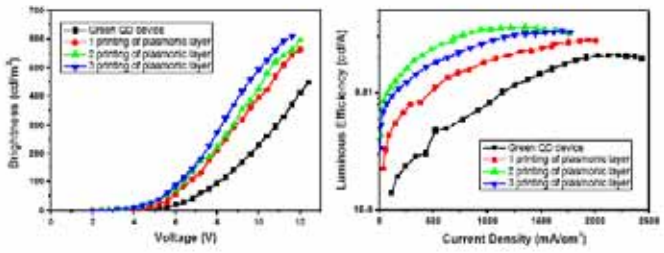
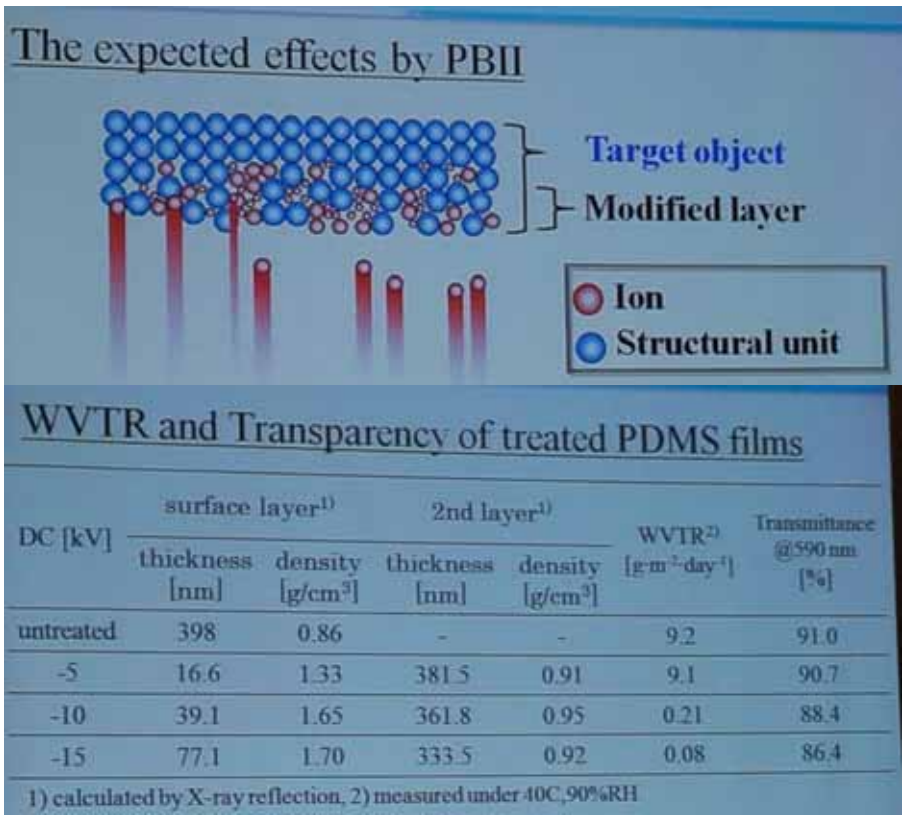


Fig. 2 Device performance of QD-EL devices according to the number of printing of a nanoplasmonic layer.

圖 32、南韓三星電子針對奈米銀粒子應用於量子點發光元件所發表之研究

圖 33 爲 LINETEC 公司發表，其利用電漿離子植入方式改善塑膠基板的阻水阻氣特性，與 PET 塑膠基板不同的是 PDMS 在經過電漿離子植入方式處理後，仍可維持其穿透度，並達成高阻水阻氣的特性。由該公司結果看來，隨著 DC 偏壓增加至 15KV，其處理深度可達 77nm，可以提昇阻水組氣特性約 100 倍。



WVTR and Transparency of treated PDMS films

DC [kV]	surface layer[1]		2nd layer[1]		WVTR[2] [g·m⁻²·day⁻¹]	Transmittance @590 nm [%]
	thickness [nm]	density [g/cm³]	thickness [nm]	density [g/cm³]		
untreated	398	0.86	-	-	9.2	91.0
-5	16.6	1.33	381.5	0.91	9.1	90.7
-10	39.1	1.65	361.8	0.95	0.21	88.4
-15	77.1	1.70	333.5	0.92	0.08	86.4

1) calculated by X-ray reflection, 2) measured under 40C,90%RH

圖 33、利用電漿離子植入方式改善塑膠基板的阻水阻氣特性

圖 34 爲國外知名市場分析公司 IDTechEx 針對可撓式基板之阻水阻氣層所做的市場趨勢分析，根據分析，可撓式基板之阻水阻氣層仍以多層膜有機無機的堆疊方式具最佳效果，目前市場仍以 a-Si 及 CIGS 薄膜太陽能電池爲主，但後續較看好之市場則爲 CIGS 薄膜太陽能電池及 OLED 顯示器。

圖 34、IDTechEx 針對可撓式基板之阻水阻氣層所做的市場趨勢分析

四、建　議　事　項

(一)在可撓式薄膜元件應用方面，藉由產能、儲能、感測器等元件間相互整合，藉以發揮整合型可撓式薄膜元件最大效益，此研發方向可提供本所未來電漿領域發展跨領域研究方向。

(二) 因應產業低成本考量，目前可撓式元件鍍膜技術走向印製技術，主要關鍵仍爲材料的開發，許多材料雖被開發出來，但其特性及可靠度仍不及真空鍍膜，迫使相關應用走向低階市場應用。

(三)透明導電膜材料於可撓式薄膜元件的應用及開發上具市場發展潛力，可針對此材料於可撓式基板上進行先期開發。

(四)可撓式電漿鍍膜設備及技術開發屬次世代元件研發熱門技術，需掌握廠商最新開發方向，並於技術開發過程與相關廠商搭配，共同參與合作開發，以利後續技術推展。

五、附　錄

INTERNATIONAL CONFERENCE ON FLEXIBLE AND PRINTED ELECTRONICS 2013
THE SHILLA HOTEL, JEJU ISLAND, KOREA, SEPTEMBER 10-13, 2013

The 2013 International Conference on Flexible and Printed Electronics (ICFPE2013) will be held from Tuesday September 10th to 13th at The Shilla Hotel in Jeju Island, Korea. The purpose of the conference is to provide scientists, engineers and researchers with opportunities to exchange research progress and information and to discuss the future directions of the rapidly growing field of flexible and printed electronics. The conference will cover all the aspects of science, technology, and business in the field of printed and flexible electronics, and will review emerging applications that will directly benefit from mechanical flexibility and printed processes, such as transistors, photonic devices, solar cells, batteries, displays, RFID, sensors, and many others.

The previous ICFPEs were held in Jeju, Korea (350 participants, 2009), in Hsinchu, Taiwan (400 participants, 2010) and in Tokyo, Japan (more than 1,000 participants, 2012). This year, the 4th ICFPE is being organized by the Korea Printed Electronics Association (KoPEA), with the support of the Organic Electronics Association (OE-A), and various research groups in Japan, Taiwan and China. Many leading scientists and engineers invited from Asia, Europe and the USA will present relevant and up-to-date overviews of current developments in this field. We look forward to welcoming you to Jeju Island in September 2013.

Kinam Kim
President & CEO, Samsung Display Company
Chair of ICFPE 2013

Topics of interest include (but are not limited to):

- Synthesis of functional materials
- Enabling substrate materials for flexible technology
- Electronic inks
- Printing/coating technologies
- R2R-based processes
- Large-area energy-harvesting devices
- Flexible batteries
- Stretchable electronics
- Imprinting technology
- Smart-IT components
- Standardization for printed electronics
- Functional semiconducting materials.
- Materials for insulating & passivation applications
- Equipment and machine components design/control
- Pre/post treatment in printing processing
- Ink rheology and transfer mechanics
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- Transfer technology
- Bio applications
- Printed transistors for display backplane and integrated circuits

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Environmental instability of solution-processed indium zinc oxide thin-film transistors

Ms. Jung-Hye Kim (Daegu Gyeongbuk Institute of Science and Technology, Korea)

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Mr. Wataru Shinoda (Yamagata Univ., Japan)

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Mr. Hanho Park (Dankook Univ., Korea)

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Mr. Dongwook Kim (Hongik Univ., Korea)

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Ms. JinAh Park (Sunchon Nat'l Univ., Korea)

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Mr. Yeongjun Lee (Pohang Univ. of Science and Technology, Korea)

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Mr. Wei Tang (Shanghai Jiao Tong Univ., China)

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Push Coating of Organic Thin-Film Transistors: New Stamp Composition for Small Molecule Semiconductors

Mr. Mitsuhiro Ikawa (Nat'l Institute of Advanced Industrial Science and Technology, Japan)

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All Gravure Printed Wireless Pseudo Triangular (±)-Wave Generator

Mr. Younsu Jung (Sunchon Nat'l Univ., Korea)

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Dr. Jeong-Il Park (Samsung Electronics, Korea)

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Ionic Self Assembled Monolayer for Improved Contact Resistance in Coplanar Structured Polymer Field-Effect Transistors

Dr. Jiyoul Lee (Samsung Electronics, Korea)

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Dr. Jiyoul Lee (Samsung Electronics, Korea)

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Dr. Jiyoul Lee (Samsung Electronics, Korea)

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Mr. Hojoong Kim (Yonsei Univ., Korea)

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Prof. Woong Choi (Kookmin Univ., Korea)

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Prof. Yih-Shing Lee (Minghsin Univ. of Science & Technology, Taiwan)

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Dr. Norio Onojima (Univ. of Yamanashi, Japan)

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Mr. Tran Quang Trung (Sungkyunkwan Univ., Korea)

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Mr. Doil Kim (Sungkyunkwan Univ., Korea)

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Ms. Mi Jang (Sungkyunkwan Univ., Korea)

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Mr. Sung Won Cho (Sungkyunkwan Univ., Korea)

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Flexibility improvement of oxide thin film transistors by using PVP/Al2O3 multi-layer gate dielectrics

Mr. Byeong-Ung Hwang (Sungkyunkwan Univ., Korea)

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Prof. Katsuaki Suganuma (Osaka Univ., Japan)

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Prof. Zheng Cui (Suzhou Institute of Nanotech Chinese Academy of Sciences, China)

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Dr. Youngmin Choi (Korea Research Institute of Chemical Technology, Korea)

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Prof. Tatsuo Mori (Aichi Institute of Technology, Japan)

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Prof. Yanlin Song (Institute of Chemistry, Chinese Academy of Sciences, China)

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Prof. Shizuyasu Ochiai (Aichi Institute of Technology, Japan)

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Characterization on carbon nanotubes an silver nanowires in transparent conducting film using Scanning Kelvin Probe Microscopy

Mr. Haeseong Lee (Jeonju Univ., Korea)

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Synthesis and Characterization of Cu-Zn Nanoparticles by Submerged Arc Discharge Method

Prof. Rachawee Savanglaa (Chulalongkorn Univ., Thailand)

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Electrical Functionality and Reliability of Silver Tracks and Thin Film on Nanostructured Paper

Dr. Thi Thi Nge (Osaka Univ., Japan)

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Improvement of gas barrier property of poly(dimethylsiloxane) films by plasma based ion implantation.

Mr. Yuta Suzuki (LINTEC corporation, Japan)

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Improvement of green quantum dot light emitting diode through control of

Mr. Daekyoung Kim (Sungkyunkwan Univ., Korea)

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Seeded Growth of Cu Nanowires and their Application for Flexible, Transparent, Conducting Films

Dr. Yoon-Cheol Ha (Duke Univ., United States)

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Prof. Pen-Cheng Wang (Nat'l Tsing Hua Univ., Taiwan)

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Prof. Hyun-Dam Jeong (Chonnam Nat'l Univ., Korea)

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Mr. Bu-Seup Song (Samsung Fine Chemicals, Korea)

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Mr. Byung Ju Kang (Hanyang Univ., Korea)

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Development of new polymeric semiconductor materials and photocurable, patternable dielectric materials: Characterization, Performance and Application

Dr. Mingqian He (Corning Incorporated, United States)

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Green Colour Selective Organic Photodetector Based on Quinacridone/Thiophene Derivative Bulk Heterojunction

Dr. Kyu-Sik Kim (Samsung Electronics, Korea)

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The barrier height between graphene-CNT in all-carbon transistor

Dr. Tae Geun Kim (Samsung Electronics, Korea)

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Mr. Ulrich Männl (Univ. of Cape Town, South Africa)

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Highly conductive and transparent solution-processed indium tin oxide nanoparticle films after oxygen partial pressure controlled annealing

Ms. Na-Rae Kim (Seoul Nat'l Univ., Korea)

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Electrical properties of printed indium tin oxide thin films

Ms. Jieun Koo (Nat'l Korea Maritime Univ., Busan, Korea)

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Morphology Control of Ordered Si Nanowire Arrays by Nanosphere Lithography and Metal-assisted Chemical Etching

Mr. Tae-Yeon Hwang (Hanyang Univ., Korea)

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Electrically Reliability of Cu-Solder Interconnect on Flexible Substrates

Ms. Seung-Hyun Kim (Andong Nat'l Univ., Korea)

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Interfacial Bonding Characteristics of Cu-Cu Pattern Direct Bonds for Flexible Electronics

Ms. Min-Su Jeong (Andong Nat'l Univ., Korea)

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Facile synthesis of Cu-Ag core-shell nanoparticles by using pulsed wire evaporation method for application of printed electronics

Mr. Changkyu Kim (Korea Atomic Energy Research Institute, Korea)

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Evaluation of Electrical Conductivity of Graphene / PMMA Composite Designed by percolation pathway with Ethylene-Maleic Anhydride Copolymer Coupling Agent

Mr. Seung han Ryu (Hanyang Univ., Korea)

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An Electrochemical Synthesis of ZnO Nanobelt-Like Structures

Dr. Seung-Youl Kang (Electronics and Telecommunications Research Institute, Korea)

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Solution-processed composite organic gate insultor for high-performance indium zinc oxide transistor.

Mr. Byeong-Geun Son (Inha Univ., Korea)

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Alignment and assembly of silver nanowires via physical confinement of patterned substrate

Mr. cong zhang (Institute of Chemistry, Chinese Academy of Sciences, China)

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Nanocarbon/Silver Nanowire Hybrid-based Transparent Conducting Films

Mr. Min Jae Joo (Inha Univ., Korea)

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Synthesis of Ultra-long Silver Nanowires and Application to Transparent Electrode

Mr. Teppei Araki (Osaka Univ., Japan)

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Evaluation of Trapped Charge Density in Organic Ferroelectric Capacitors Based on Mott-Schottky Model

Mr. Xue Zhang (Hallym Univ., Korea)

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Highly Stable and Flexible Silver Nanowire-Graphene Hybrid Transparent Conducting Electrode for Emerging Optoelectronic Devices

Mr. Hyungjin Lee (Daegu Gyeongbuk Institute of Science & Technology, Korea)

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Synthesis and Characterization of Cu-Zn Nanoparticles through Microwave-assisted Polyol Co-reduction Process

Prof. Rachawee Savanglaa (Chulalongkorn Univ., Thailand)

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Effect of nanowire addition on electrical conductivity of Ag nano-ink

Ms. Han Hyun-Suk (Korea Institute of Machinery & Matrials, Korea)

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Composite conducting polymer electrode for improving the thermal stability

Ms. Su Bin Heo (Yeungnam Univ., Korea)

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Ms. Su Bin Heo (Yeungnam Univ., Korea)

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Ag nanowire through microwave irradiation for transparent electrodes

Mr. Sung Ho Lee (Yeungnam Univ., Korea)

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Ag nanowire synthesized with control of capping agents for transparent electrodes

Mr. Sung Ho Lee (Yeungnam Univ., Korea)

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Synthesis and Characterization of Hole-Transporting Polymers Capable of Photo Cross-linking

Ms. Juwon Lee (Korea Research Institute of Chemical Technology, Korea)

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Synthesis of new binder polymers for dye-pigment hybrid color resists

Ms. Jihee Kwon (Korea Advanced Institute of Science and Technology, Korea)

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Dr. Stephan Feser (ALTANA AG, Germany)

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Ms. Miae Kim (Korea Advanced Institute of Science and Technology, Korea)

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Mr. Min-Kyu Kim (Sungkyunkwan Univ., Korea)

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Dr. Kyu-Ha Baek (Electronics and Telecommunications Research Institute, Korea)

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Mr. Walailuk Limkitnuwat (Chulalongkorn Univ., Thailand)

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Synthesis and Characterization of Copper (core) -Silver (shell) Nanoparticles by Polyol Successive Reduction Process

Mr. Phatcharaphon Panyarueng (Chulalongkorn Univ., Thailand)

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Dr. Kwan-Sik Jang (Nano Smart Material , Korea)

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Ms. Dong-Eun Kim (Pohang Univ. of Science and Technology, Korea)

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Mr. Yoonsoo Rho (Korea Institute of Industrial Technology, Korea)

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Mr. Jae-Kwan Kim (Sunchon Nat'l Univ., Korea)

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Ms. Hyo Jin Kim (Inha univ., Korea)

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Ms. Su-Young Son (Chonbuk Nat'l Univ., Korea)

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Ms. Su-Hyeon Kim (Chonbuk Nat'l Univ., Korea)

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Cost-effective ITO-free organic solar cells with silver nanowire-PEDOT:PSS composite electrodes

Mr. Yong-Jin Noh (Chonbuk Nat'l Univ., Korea)

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Extremely high-conducting PEDOT:PSS films for ITO-free photovoltaic cells

Mr. Su-Cheol Park (Chonbuk Nat'l Univ., Korea)

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Mr. JongHwa Park (Ulsan Nat'l institute of science and technology, Korea)

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Efficient Polymer solar cells with brush painted MoO3 as an hole transport layer

Ms. Se-phin Cho (Chonbuk Univ., Korea)

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Novel liquid-crystalline organic semiconductors based on thieno[3,2-b]thiophene for organic field-effect transistors

Dr. Yuna Kim (Hokkaido Univ., Japan)

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Ambipolar Characteristics of Phthalimide Derivative Semiconducting Polymers with with Modified Molecular Structure

Ms. Sun-Jung Lee (Kookmin Univ., Korea)

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Dr. Hea-Jeong Cheong (Nat'l Institute of Advanced Industrial Science and Technology, Japan)

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Microstructure and mechanical property of Fe-Ni-(Mo, Si) alloy produced by powder sintering

Mr. Jong Seok Park (Kongju Nat'l Univ., Korea)

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Ms. Hyena Kwak (Sungkyunkwan Univ., Korea)

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Ms. Hojeong Yu (Ulsan Nat'l Institute of Science and Technology, Korea)

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Ms. A-Reum Han (Ulsan Nat'l Institute of Science and Technology, Korea)

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Mr. Jaehyu Han (Yonsei Univ., Korea)

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Novel Enhancement of Photoluminescence in Cross-Junction of Core-Shell Hybrid Organic Nanowires Coated with Au Nanotubes

Mr. Donghun Bae (Inha Univ., Korea)

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Ms. Kahee Kim (Inha Univ., Korea)

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Mr. Jae-Kwan Kim (Sunchon Nat'l Univ., Korea)

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Mr. Chi Gyun Song (Sunchon Nat'l Univ., Korea)

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Prof. Tae-Dong Kim (Hannam Univ., Korea)

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Dr. Manho Kim (Hanyang Univ., Korea)

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Controlled synthesis of Fe_3O_4 nanoparticles and its application to photonic crystal display

Dr. Beom-Jin Yoon (Korea Electronics Technology Inst., Korea)

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Silicon carbide nano-ink prepared by mechanical milling

Dr. Beom-Jin Yoon (Korea Electronics Technology Inst., Korea)

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Formulation of printable membrane-type devices for stick-and-play system

Prof. Heung Cho Ko (Gwangju Institute of Science and Technology, Korea)

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High Performance Deformable Biointegraed Devices

Prof. Dae-Hyeong Kim (Seoul Nat'l Univ., Korea)

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Printed Stretchable Electronics with Nano-materials

Prof. Woo Soo Kim (Simon Fraser Univ., Canada)

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Electrohydrodynamic direct-writing buckled fiber-array of stretchable sensor

Prof. YongAn Huang (Huazhong Univ. of Science and Technology, China)

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Flexible Nonstick Replica Mould for Transfer Printing of Ag Ink

Dr. Bong Kuk Lee (Hallym Univ., Korea)

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Elastic, Printable Circuit Elements Fabricated from a Conducting Polymer-Elastomer Nanocomposite

Mr. Milroy Craig Andrew (University of Texas, Austin, United States)

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Single-Walled Carbon Nanotube-Dispersed Thin Films for Transparent Stretchable Multi-Modal Touch sensors

Ms. Mini Mol Menamparambath (Sungkyunkwan Univ., Korea)

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Organic Thin-Film Transistor with Embedded Electrodes on Polydimethylsiloxane Films

Dr. Soon-Won Jung (Electronics and Telecommunication Research Institute, Korea)

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Wrinkle engineering of the III-V semiconductor nanomembrane

Mr. Doo-Seung Um (Ulsan Nat'l Institute of Science and Technology, Korea)

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Nano-Composite Silver Thin Films on Stretchable Substrates with High Conductivity and Mechanical Stability

Mr. Shih-Pin Chen (Nat'l Taiwan Univ., Taiwan)

G04-P04

Development of both sides mechanoluminescence-emitting films with flexible/stretchable properties based on elastomeric polymer

Mr. Kyung-Il Joo (Daegu Gyeongbuk Institute of Science and Technology, Korea)

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Copper Nanowire-Based Stretchable Transparent Conductors

Ms. Yulim Won (Yonsei Univ., Korea)

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Development of deep wrinkle formation by oxygen treatment on stretched elastomeric polymer

Mr. Seongkyu Song (Daegu Gyeongbuk Institute of Science and Technology, Korea)

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Measurement of Angle and Pressure of Doctor Blade in Printing Process using Actuator Signals

Prof. Chung Hwan Kim (Chungnam Nat'l Univ., Korea)

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2D-Footprint R2R Manufacturing Plant for Printed Electronics

Dr. Sorin G. Stan (VDL FLOW, The Netherlands)

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Force based measurement method and model development of synchronization errors in offset type printing process

Dr. Dongwoo Kang (Korea Institute of Machinery and Materials, Korea)

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Fuzzy gain scheduling to optimize tension control characteristics with roll radius variation

Dr. Ganeshthangaraj Ponniah (Korea Institute of Machinery and Materials, Korea)

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Synchronous control of a roll-to-plate gravure offset printing system

Dr. Hyunchnag Kim (Korea Institute of Machinery & Materials, Korea)

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Operational Design of Magnetostrictive Inkjet Head with BackPressure

Prof. Young-Woo Park (Chungnam Nat'l Univ., Korea)

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RMD Monitoring System for FPCB using R2R Printing Technologies

Prof. Sang-Chul Kim (Kookmin Univ., Korea)

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Two-dimension Phase-retardation Distribution Inspections for Flexible Displays by Using Full-field Liquid-Crystal Modulating Common-path Interferometry

Ms. Wen-Chun Liu (Industrial Technology Research Institute, Taiwan)

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Fundamental Characteristics of Robot Arm Utilizing Electrostatic Inkjet Phenomena

Mr. Sugiura Taito (Tokai Univ., Japan)

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Polymer flm elongation rate control for registration control

Mr. Ok-Jin Kim (Sung-an Machinery, Korea)

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Developing Junction-Free Hyperfine Micro Cylindrical Mold Reproduction Technique

Dr. Dae-Yup Na (Chungnam Display Center, Korea)

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Tension Control of Web of Winder Span using Adaptive Gain Control Method

Prof. Chung Hwan Kim (Chungnam Nat'l Univ., Korea)

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Control of Printing Pressure by Direct Measurement of Nip Width between Printing Cylinders

Mr. Ki Sang Nam (Chungnam Nat'l Univ., Korea)

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All-organic self-contact transistors

Ms. Sumika Tamura (Tokyo Institute of Technology, Japan)

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Development of a high precision roll-to-plate gravure offset printing system

Dr. Hyunchnag Kim (Korea Institute of Machinery & Materials, Korea)

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Investigation of synchronization error to improve overlay with gravure offset printing

Mr. Eon-Seok Lee (Korea Institute of Machinery and Materials, Korea)

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Thickness Measurement of PDMS for Reliable Offset Printing

Mr. Deokkyun Yoon (Korea Institute of Machinery and Materials, Korea)

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Analytic Modelling for the Effect of Synchronization on Fine pattern in Roll Contact-type Printing

Dr. Taik-Min Lee (Korea Institute of Machinery and Materials, Korea)

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Bidentate ligand-protected Ag nanocrystals

Prof. Hu Zhou (Wuhan Textile Univ., China)

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Multi-stopband Photonic Crystals Microchip for High-performance Metal Ions Recognition

Dr. Fengyu Li (Chinese Academy of Sciences, China)

G06-O04

PEDOT:PSS for structured transparent electrodes and hole-transportation layers

Dr. Detlef Gaiser (Heraeus Precious Metals GmbH & Co. KG, Germany)

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Printing of Metallic Conductors on Biodegradable Polylactic Acid (PLA) Substrates: Characterization of Electrical and Sensing properties

Mr. Andrés Vásquez Quintero (École Polytechnique Fédérale de Lausanne, Switzerland)

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Graphene Modified Carbon Paste Electrode for Electrochemical Detection of Mycobacterium tuberculosis-DNA

Mr. Chakrit Sriprachuabwong (National Electronics and Computer Technology Center, Thailand)

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Material characterization and electrochemical performance for all-inkjet organic ISFET-based biosensor

Mr. Carme Martinez-Domingo (Universitat Autonoma de Barcelona, Spain)

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Precision Patterning of Gelatin Utilizing Electrostatic Inkjet

Prof. Shinjiro Umezu (Tokai Univ., Japan)

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Preparation and Characterization Conducting PPy-SiO_2 Inks

Prof. Shuichi Maeda (Tokai Univ, Japan)

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Screen printed graphene electrode for the detection of DNA of Aspergillus flavas using H33258 indicator and linear sweep voltammetry

Ms. Chanpen Karuwan (Nat'l Electronics and Computer Technology Center, Thailand)

G06-P04

Study of Silver Nanowires Paste for Bridge Electrodes

Mr. MinHyeok Cha (Kongju Nat'l Univ., Korea)

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Investigation of Ink-jet Printed Silver Electrodes Used in High Frequency Ultrasonic Transducers

Mr. Adit Decharat (Univ. of Tromso, Norway)

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Aqueous conductive ink Based on SWCNT dispersed by Water-Soluble Conducting Polymer

Mr. Jae Min Shim (Chonbuk Nat'l Univ., Korea)

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Contact Imprinting of Metal Nanostructures on Flexible Substrates for Biomolecule Sensing Applications

Mr. Jihye Lee (Yonsei Univ., Korea)

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Dr. Kazuo Senda (Micro-Engineering Inc., Japan)

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Dynamics Characteristics analysis on matching correlation between thermal effect and register of a moving substrate in roll-to-roll multi-layer printing systems

Mr. Jongsu Lee (Konkuk Univ., Korea)

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Development of precision web scale encoder to measure the displacement and velocity of flexible web in R2R printing system

Dr. Dongwoo Kang (Korea Institute of Machinery and Materials, Korea)

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Gravure Printing of Graphene Layer on Flexible Substrates for Wireless Passive Strain Sensors Application

Dr. Leo Shen (Shanghai Normal Univ., China)

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An effect of process parameters on printed line width in high resolution roll-to-roll gravure printing

Dr. Ho Anh Duc Nguyen (Konkuk Univ., Korea)

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Proving Scalability of R2R Gravure for Fully Printing Thin Film Transistors on 100 M Length of Plastic Roll

Mr. Wookyu Lee (Sunchon Nat'l Univ., Korea)

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Analyzing of Conductive Micro Fine Line using Direct Gravure Roll to Roll Printing Method

Mr. Huu Phuong Hoang (Konkuk Univ., Korea)

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Development of Precise Tension Control System Using Stage Type Accumulators for R2R Printed Electronics

Mr. Jang-Hwan Lee (Sung-an Machinery, Korea)

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Plastic Materials and Films for Flexible Display

Mr. Taejung Kim (Samsung Cheil Industries, Korea)

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Lateral Control System for Roll-to-Roll Fabrication Process of OPV

Mr. Hwiyong Choi (Konkuk Univ., Korea)

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Active Web Tension Controller for R2R Printed Electronics Machine

Mr. Seong Joon Heo (BlueSys , Korea)

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Continuous, Highly flexible and Transparent Silver nanowire Films by Roll-to-Roll Coating for Organic photovoltaic(OPV) cells

Mr. Byung-Yong Wang (Korea Institute of Science and Technology, Korea)

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Fabrication of Double-Side Printed Circuit by using Roll-to-Roll Gravure Printing Process

Mr. Janghoon Park (Konkuk Univ., Korea)

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The development of flexible solid state electrochromic device for bypass battery application

Dr. Ming-Chuan Wang (Institute of Nuclear Energy Research, Taiwan)

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Stability Issues on Inkjet Line Printing

Dr. Heuiseok Kang (Korea Institute of Industrial Technology, Korea)

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Microsized line printing by femto-liter droplet inkjet technology

Dr. Joonghyuk Kim (Samsung Electronics, Korea)

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Progress towards industrial all-inkjet printed devices and circuits

Prof. Eloi Ramon (Universitat Autonoma de Barcelona, Spain)

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Die attach and wire bonding on inkjet printed structures on oxidized silicon wafers

Dr. Thomas Knieling (Fraunhofer ISIT, Germany)

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Laser induced forward transfer of conductive adhesives for chip interconnection

Dr. Sandeep Menon Perinchery (Holst Centre, The Netherlands)

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Fabrication of addressable steel-based multi-nozzle for parallel electrohydrodynamic printing

Prof. YongAn Huang (Huazhong Univ. of Science and Technology, China)

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Effect of Surface Contact Angle on Liquid Transfer in Low Speed Printing Process

Prof. Ki-Yeol Shin (Daegu Future College, Korea)

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Fabrication of copper wiring by micro-contact printing method and electroless plating and electroplating

Dr. Kazuhiko Tokoro (Advanced Industrial Science and Technology, Japan)

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Fully-Sprayed Gas Sensors of Patterned Carbon Nanotube Thin-Films

Dr. Alaa Abdellah (Technische Universitaet Muenchen, Germany)

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Real-time and in-situ monitoring of flash photonic sintering of inkjet-printed silver ink on plastic substrate

Mr. Mohamed Saadaoui (Ecole des Mines de Saint-Etienne, France)

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Polyols as novel reducing agents for laser induced microfabrication of copper conductors on ceramics, glass-ceramics and glass fiber surfaces

Mr. Ilya Tumkin (Saint-Petersburg State Univ., Russian Federation)

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Foil-to-foil integration of sensor foils through capillary self-alignment

Mr. Gari Arutinov (Holst Centre/TNO, The Netherlands)

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Surface Micromachined Inkjet-printed MEMS Micro-bridge on Plastic Foil

Mr. Francisco Molina-Lopez (École Polytechnique Fédérale de Lausanne, Switzerland)

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Inkjet-printed graphene modified electrode on low-cost and disposaple paper-based electrochemical sensor

Ms. Chanpen Karuwan (Nat'l Electronics and Computer Technology Center, Thailand)

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A Novel Approach for Optimization of Micro Pattern Printing in Roll-to-Roll Gravure Printing Process

Mr. Jongsu Lee (Konkuk Univ., Korea)

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Making narrow line for flexible display by inkjet printing system

Mr. Myoung Ho Lee (LG Display, Korea)

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Multilayer Inkjet Printing Process for Flexible Electronics

Mr. Mohamed Saadaoui (Ecole des Mines de Saint-Etienne, France)

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A Novel Method for Fine Patterning by Piezo-electrically Induced Pressure Adjustment of Inkjet Printing

Mr. Young-Tae Kwon (Hanyang Univ., Korea)

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Improvement of printing films quality and suppress of boundary movement by optimizing ink formula

Mr. Jeng-Lung Lin (Nat'l Taiwan Univ., Taiwan)

G08-P05

A Study on Thin Film Coating Technology by Micro-Gravure Coater

Prof. Dongsoo Kim (Hanbat Nat'l Univ., Korea)

G08-P06

Inkjet Printed Continuous Photonic Crystal Line based on Combined Effects of Superficial Latex Consistence and Surface Tension difference

Ms. Meijin Liu (Institute of Chemistry, Chinese Academy of Sciences, China)

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Fabrication of transparent conductive film by reverse off-set printing for organic solar cells

Mr. Sun-Woo Kwak (Korea Institute of Machinery and Materials, Korea)

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Printed Electrowetting-on-Dielectric Device using Reverse-Offset-Printing

Dr. Seung Jun Lee (Korea Institute of Machinery & Materials, Korea)

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Micro-sized Metal Patterns Forming without Thermal Damage by a Combination of Microcontact Printing and Electroless Plating Techniques

Dr. Miki Onoue (Nat'l Institute of Advanced Industrial Science and Technology, Japan)

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(3-glycidoxypropyl)trimethoxysilane adhesion promoter for Cu paste

Dr. jianwei jiang (Kongju Nat'l Univ. Korea)

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Improvement of Printed Pattern Quality in Roll-to-roll Gravure Printing Dependent on Printing Condition

Mr. Bongmin Kim (Korea Institute of Machinery & Matrials, Korea)

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Resonant electrohydrodynamic jetting using sinusoidal voltage signal

Mr. Ho Kim (Korea Univ., Korea)

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Drop on demand electro-hydrodynamic printing induced by square pulse voltage signal and jetting at the resonant frequency using sinusoidal voltage signal

Mr. Ho Kim (Korea Univ., Korea)

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Fabrication of Ultrafine Metallic Electrodes using Plasma Surface Treatment and Laser Ablation Process for Flexible Electronics

Dr. Soo-Jung Son (Korea Institute of Materials Science, Korea)

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Large-scale Organic Nanowire Printed Electronics and Lithography

Mr. Sung-Yong Min (Pohang Univ. of Science and Technology, Korea)

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Electrohydrodynamic jetting on demand using square pulse voltage

Mr. Jungkeun Yang (Korea Univ., Korea)

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Electrohydrodynamics Jet Printing: Alternative Fabrication Manner for Terahertz Metamterial

Mr. Hadi Teguh Yudistira (Sungkyunkwan Univ., Korea)

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Why Can Single-Crystal Films be Obtained by Double-Shot Inkjet Printing?–Peculiar Mixing Mechanism of Microdroplets

Dr. Yuki Noda (Nat'l Institute of Advanced Industrial Science and Technology, Japan)

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Double-shot Inkjet Printing of Single-crystal Films of Organic Semiconductors:Dependence of Process Conditions

Dr. Hiromi Minemawari (Nat'l Institute of Advanced Industrial Science and Technology, Japan)

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Plasma Modification of Spray Deposited Graphene on Mica

Mr. Jeremiah Guillen Chan (Ateneo De Manila Univ., Philippines)

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Facile and Rapid Patterning via Magnetic printing method

Mr. Kwang Se Lee (Korea Advanced Institute of Science and Technology, Korea)

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Analysis of ink cohesion and adhesion in reverse-offset printing

Ms. A-Ram Lee (Korea Institute of Machinery & Materials, Korea)

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Rheology of Aqueous Cu Nano Ink including PSM binder for improving adhesive force of Inkjet-printed Cu Patterns on Polyimide Film

Dr. Beyong-Hwan Ryu (Korea Research Institute of Chemical Technology, Korea)

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Xenon Flash Lamps and Systems for Rapid Heating

Mr. Martin Brown (Heraeus Noblelight, United Kingdom)

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Tailored infrared tool for drying and sintering processes in Printed Electronics

Mr. Kang Jin Lee (Heraeus Oriental HiTec, Korea)

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Electric Field Assisted Laser Induced Forward Transfer

Mr. Jaeik Jeong (Korea Univ., Korea)

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Prediction of Drop-On-Demand(DOD) Pattern Size in Pulsed –Voltage-Applied Electrohydrodynamic(EHD) Jet Printing

Mr. Jaehong Park (Yonsei Univ., Korea)

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Spray-coated Silver Nanowire Flexible Transparent Electrode and Its Application for Efficient Organic Solar Cell

Dr. Sung-Eun Park (Yonsei Univ., Korea)

[G09] Printed/Flexible Displays

G09-I01

Full-Color Light-Emitting Diodes Based on Quantum Dot (QDs) and QD-Polymer Hybrids

Prof. Changhee Lee (Seoul Nat'l Univ., Korea)

G09-I02

What is the ultimate efficiency of OLEDs

Prof. Jang-Joo Kim (Seoul Nat'l Univ., Korea)

G09-I03

Extremely Bendable Thin Film Encapsulation of Organic Light Emitting Diodes

Prof. Ho Kyoon Chung (Sungkyunkwan Univ., Korea)

G09-I04

Progress of Flexible Display Technology and Beyond

Dr. Hiroki Hamada (Kinki Univ., Japan)

G09-P01

Display-Quality Measurement of Flexible Ch-LCD by Using an Automatic Bending Test Measurement System

Ms. Wen-Chun Liu (Industrial Technology Research Institute, Taiwan)

G09-P02

Development of a Film-type Connector Toward Flexible Electronics

Dr. Ryosuke Mitsui (Japan Aviation Electronics Industry, Japan)

G09-P03

Fabrication of Black Silver Electrodes for Display Appliances

Prof. Dong-Youn Shin (Pukyong Nat'l Univ., Korea)

G09-P04

Performance enhancement for Ag nanowire-based transparent conductor using TiO_2 sol-gel

Mr. Sunho Kim (Sungkyunkwan Univ., Korea)

G09-P05

Fabrication of conductive patterns on PET by metal transfer method

Mr. Da-Hyeok Lee (Inha Univ., Korea)

G09-P06

Highly Efficient Organic Solar Cells with Solution-Processed Silver Nanowire Electrodes

Prof. Jae-Wook Kang (Chonbuk Nat'l Univ., Korea)

G09-P07

Fabrication of Organic Light Emitting Diode via Thermally Crosslink-able Hole-Transporting Material for Solution Process

Mr. Hyun Han (Korea Research Institute of Chemical Technology, Korea)

G09-P08

Light Emissions from Organic Crystal Field-effect Transistors with Dual Gate Contacts

Dr. Takenori Kitazawa (Kyoto Institute of Technology, Japan)

G09-P09

Fabrication of three-dimensional (3D) crack free silica colloidal assembly using the lift-up method

Ms. Mi Ri Kim (Kongju Nat'l Univ., Korea)

G09-P10

UV-Curable Screen Printing Inks for Electroluminescent Display Lamps

Dr. Ilja Maksimenko (ALTANA AG, Germany)

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Improvement of optoelectrical characteristic of GaN-based light-emitting diodes on flexible substrate

Dr. Wun-Wei Lin (Nat'l Taipei Univ. of Technology, Taiwan)

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All-Solution-Processable Electron Trapping Organic Memory Device with Inherent Flexibility

Mr. Chaewon Kim (Kookmin Univ., Korea)

G09-P13

Direct Printing Method for Micro-lens and Micro-lens Array Fabrication by Using Electrohydrodynamic (EHD) Jet Printing Technology

Mr. Baekhoon Seong (Sungkyunkwan Univ., Korea)

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Printed polymer thin film transistors with high-k barium titanate insulator

Mr. ByoungJoon Ahn (Konkuk Univ., Korea)

G09-P15

Effect on TiO_2 and Graphene additive of the inorganic electroluminescent device printed with a screen printing

Mr. Sung-Ho Jo (Pukyong Univ., Korea)

G09-P16

Preparation of invisible metal-grid transparent electrodes by electrohydrodynamic printing and its application to optoelectronic devices

Dr. Jihoon Kim (Kongju Nat'l Univ., Korea)

G09-P17

Preparation of color microcapsule for Electrophoretic display

Mr. Nam-Seok Cho (Noroo Holding's, Korea)

G09-P18

Fabrication of Coatable Polarizer Based on Lyotropic Chromonic Liquid Crystal by spontaneous Orientation for Flexible Display

Ms. Yu-Jin Jeong (Chonbuk Nat'l Univ., Korea)

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Preparation of Protrusion by Printing Technique with Polyimide Photoalignment Layer for VA Mode LCD

Mr. Seok-Woon Jang (Chonbuk Nat'l Univ., Korea)

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High Performance Tandem Organic Photo Diode with Selective Green Wavelength

Mr. Kyung-Bae Park (Samsung Electronics, Korea)

G09-P21

ITO-free, semi-transparent organic photovoltaics with spray and lamination

Mr. Dong Ju Jang (Dankook Univ., Korea)

G09-P22

Characteristics of Flexible OLED Devices Using ALD Passivation

Dr. Dong-Eun Kim (Pohang Univ. of Science and Technology, Korea)

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Surface-plasmon-coupled emission from quantum dots light-emitting diodes using printed nanoplasmonic layers

Dr. Tae-Ho Kim (Samsung Electronics, Korea)

[G10] Printed Solar Cells

G10-I01

Facile Microwave-assisted Synthesis of Printable Multiphase $CuInSe_2$ Nanoparticles and the Role of Secondary CuSe Phase on Photovoltaic Device Performance

Dr. Sunho Jeong (Korea Research Institute of Chemical Technology, Korea)

G10-I02

Roll-to-Roll production of organic photovoltaics using full solution-process

Dr. Jungseok Hahn (Kolon Industries, Korea)

G10-O01

Origin of Efficient Photoelectric Conversion in Donor-Acceptor-Type Polymer Solar Cells

Dr. Jun'ya Tsutsumi (Nat'l Institute of Advanced Industrial Science and Technology, Japan)

G10-O02

High Performance Supercapacitor with Carbon composite Electrodes

Dr. Yunseok Jang (Korea Institute of Machinery & Materials, Korea)

G10-O03

Metallic Glass: A New Approach of Printed Silver Electrode

Dr. Eun-Sung Lee (Samsung Electronics, Korea) (파일 없음)

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Polymer Solar Cell Modules Fabricated by Slot-die Coating Method

Dr. Jae-Ryoung Kim (Gwangju Institute of Science and Technology, Korea)

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Fabrication of Pt electrode for Dye-sensitized Solar Cell by Inkjet Technology

Mr. Kyosuke Kosugi (Tokai Univ., Japan)

G10-P03

Fabrication of Dye-sensitized Solar Cell Utilizing Light Trapping Effect

Mr. Kyosuke Kosugi (Tokai Univ., Japan)

G10-P04

Dye Adsorption of Dye-Sensitized Solar Cell (DSC) Utilized Electrostatic Inkjet

Mr. Shigeto Kawata (Tokai Univ., Japan)

G10-P05

Microstructure study of Si-alloy thin film anode electrode for flexible Li-ion batteries

Mr. Minsub Oh (Sungkyunkwan Univ., Korea)

G10-P06

Sn nanowire-based anode with Ti adhesion layer for Flexible Li-ion batteries

Mr. Younghak Song (Sungkyunkwan Univ., Korea)

G10-P07

Electrochemical Characteristics of Thin Film Activated Carbon processed by Jet milling for Flexible Supercapacitor

Mr. Daewon Kim (Korea Institute of Machinery & Materials, Korea)

G10-P08

Comparative Study of the Copper Phthalocyanine and Titanyl Phthalocyanine Nanoparticles as a Buffer Layer on the Performance of Polymer/Fullerene Bulk Heterojunction Solar Cells

Prof. Shizuyasu Ochiai (Aichi Institute of Technology, Japan)

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An energy harvester direct-written by mechano-electrospinning

Mr. Ningbin Bu (Huazhong Univ. of Science and Technology, China)

G10-P10

Flexible Lithium Battery based on 3-D Sandwich Structure of Graphite and Silicon complex anode

Mr. SangWoo Kim (Kongju Nat'l Univ., Korea)

G10-P11

The fabrication of flexible organic solar cells with thermal-imprinted cathode grid pattern

Dr. Jung Min Cho (Korea Institute of Machinery & Materials, Korea)

G10-P12

Study of PEDOT:PSS layer on the Long-time Stability for Organic Photovoltaic Applications

Ms. Hye-Jin Yang (Korea Electronics Technology Institute, Korea)

G10-P13

Vertical mobility measurement of P3HT using a dark CELIV method

Ms. Chiho Katagiri (Yamagata Univ., Japan)

G10-P14

All Printable Organic Solar Cell Module Manufactured by Stripe Patterned Wireless bar

Dr. Jong-Su Yu (Korea Institute of Machinery & Materials, Korea)

G10-P15

Paper-based supercapacitor consist of Graphene and MnO2

Mr. Kwan-Woo Park (Hanyang univ., Korea)

G10-P16

Highly Enhanced Energy Conversion Efficiency of Thermoelectricity with Controlled Conducting Polymers

Mr. Teahoon Park (Yonsei Univ., Korea)

G10-P17

Barrier height modification of Si schottky junction by inclusion of InP quantum dots and its effect in solar response

Mr. Nripendra Narayan Halder (Indian Institute of Technology Kharagpur, India)

G10-P18

Improvement of organic photovoltaic device by the morphology control of solution-processed Zinc oxide buffer layer

Mr. Seung Jae Go (Dankook Univ., Korea)

G10-P19

Stretchable Triboelectric Devices for Energy Harvesting and Sensing Applications

Mr. Jun-Young Lee (Yonsei Univ., Korea)

G10-P20

N-Doped Hard Carbon as Anode Materials for Sodium-Ion Batteries

Dr. Rajendran Suresh Babu (Sunchon Nat'l Univ., Korea)

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Flexible Primary Batteries for Versatile Applications

Mr. Inuk Song (Sunchon Nat'l Univ., Korea)

G10-P22

Cylindrical inverted hybrid photovoltaic device for efficient charge carriers separation

Dr. Jaehyun Hur (Samsung Electronics, Korea)

[G11] Pre/Post Treatment in Printing Processing

G11-P01

Influence of sintering atmosphere on electrical property of carbon encapsulated Cu nanoink

Mr. Changkyu Kim (Korea Atomic Energy Research Institute, Korea)

G11-P02

Effect of Temperature/Humidity Treatment on Interfacial Reliability on Screen-Printed Ag / Polyimide System

Mr. Byung-Hyun Bae (Andong Nat'l Univ., Korea)

G11-P03

The effect of surface characteristics of PET foil on particulate removal

Ms. Sheila Hamilton (Teknek, United Kingdom)

G11-P04

A Study on Sintering Time Reduction of Low Temperature Sintered-Type TiO_2 Paste by Using Near Infrared in the Dye-Sensitized Solar Cell Manufacturing Process

Mr. Jaekyun Ko (Hanyang Univ., Korea)

G11-P05

Fine Patterning of Copper Conductive Lines Using Ink-jet Printing and Laser Sintering

Mr. Masahiro Yanagisawa (Ricoh, Japan)

G11-P06

Effects of Plasma Surface Treatment on printability and Surface Morphology of Polyimide Films for Roll Printed NFC Antenna

Mr. Ki-Bum Park (Korea Electronics Technology Institute, Korea)

G11-P07

Low-damage Preparation of SiO_2 Thin Film by the Photo-assisted Oxidation Processing

Dr. Takehitio Kodzasa (Nat'l Institute of Advanced Industrial Science and Technology, Japan)

G11-P08

Low temperature heat treatment method for copper nano ink

Mr. Joonghyun Yeom (Hanyang Univ., Korea)

G11-P09

Xenon Flash Lamps and Systems for Rapid Heating

Dr. Martin Brown (Heraeus Oriental HiTec, Germany)

G11-P10

Sensitivity Analysis for Sintering Parameters to Develop a New Constitutive Model of Bi-Modal Powder

Mr. Seung Kyu Ryu (Pohang University of Science and Engineering, Korea)

G11-P11

Tailored infrared tool for drying and sintering processes in Printed Electronics

Mr. Kang Jin Lee (Heraeus Oriental HiTec, Korea)

G11-P12

UV treatment of solution processed Oxide TFT

Dr. Jonghyurk Park (Electronics and Telecommunications Research Institute, Korea)

G11-P13

Rapid Sintering of Copper Precursor Ink and Copper nano particle Ink by Diode Pumped Solid State(DPSS) Laser

Mr. Jun Ho Yu (Korea Institute of Industrial Technology, Korea)

G11-P14

Electrical and Mechanical Characteristics of Ag Nanocomposite Circuits Fabricated by Screen Printing

Mr. Kwang-Seok Kim (Sungkyunkwan Univ., Korea)