

光電半導體元件與系統應用計畫

執行單位

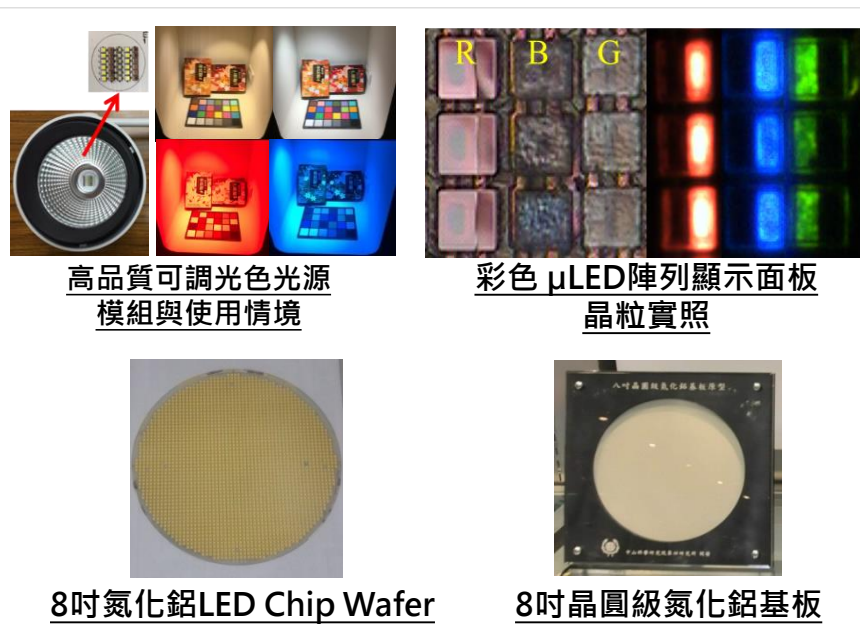
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計畫主持人

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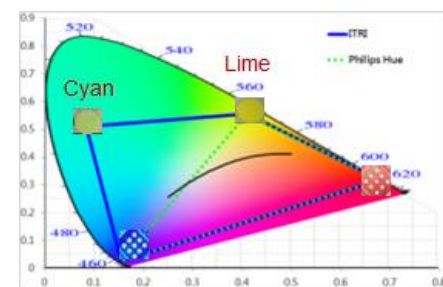
- 開發高品質可調光色照明模組技術，可應用於光色調控準確性與一致性需求高、注重省電節能效果的商業照明領域。
- 開發具創新突破之 μ LED陣列顯示技術，可將現有LED應用轉型往高值化行動穿戴裝置及未來複合式感測連網等應用發展。
- 開發高緻密、高導熱之8吋晶圓級氮化鋁基板技術，使國內產業能掌控關鍵技術及自主化生產能力，提供高頻/高功率電子元件技術開發所需。

- 導入主動式三維度布局，掌握產業與產品市場趨勢，建構具差異化技術與專利布局
- 光色一致化及多晶多色光譜擬合調控技術，提升LED照明產品之光品質與附加價值
- 批次性巨量微型元件之封裝轉移技術，及微晶粒LED畫素製造，提升微型元件封裝良率
- 絕緣高導熱之大尺寸晶圓級氮化鋁基板開發

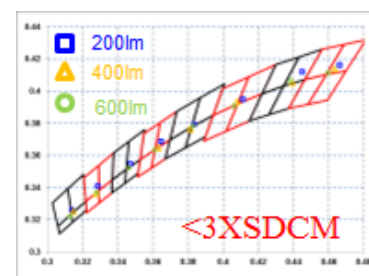


深耕光電半導體元件模組自主化技術，帶動高值化創新應用產業茁壯，創造我國光電半導體產業之全球競爭力。本計畫配合產業發展，以全方位互動式光環境為未來LED照明應用之重點市場，建立高值化智慧照明、微型LED光源於高值化行動穿戴裝置等重點系統應用關鍵技術，引領LED照明升級為智慧光服務產業，以及開發高導熱絕緣基板、氮化鋁金屬化封裝關鍵技術，加速落實LED照明普及與智慧光生活產業建構。

- 達國際領先水準之高品質可調光色照明模組技術，提升現有LED照明產品之光品質與附加價值。
- 全球領先之R/G/B微型LED晶粒陣列晶片開發，可於行動穿戴式裝置應用之高亮度、節能省電的顯示面板。
- 與日本大廠(MARUWA)技術並駕齊驅之晶圓級8吋氮化鋁基板，可導入功率電子元件，大幅提升元件之散熱性能、光電效率與高溫環境可靠度。



窄光譜單色LED+寬光譜pc-LED光譜設計



光色調控準確度驗證

Optoelectronic Semiconductor Components and System Application Technology

Execution Unit

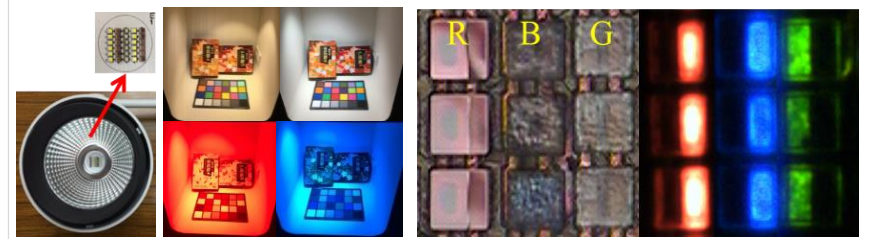
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Project Director

James, Mu-Tao Chu. Division Director

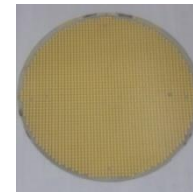
- Development of high-quality CCT adjustable lighting modules for commercial lighting applications which are with highly color control accuracy and consistency requirements.
- Development of μ LED array display technology with innovative breakthroughs that can transform existing LED applications to higher value mobile wearables and future composite sensing networking applications.
- The development of 8-inch wafer-level AlN substrate with high density and high thermal conductivity will enable the domestic industry to possess the key technologies and independent production capacity of AlN substrate, providing the required techniques for high-frequency / high-power electronic components.

- Focus on global industry and product market trends, develop advanced technologies and patent portfolio.
- Lighting color consistency and multi-color multi-chip spectrum adjustable technologies enhance the light quality of LED lighting products.
- Batch-level mass transfer technology of micro-assembly system, microLED pixel production, micro-assembly yield improvement.
- Development of large-size wafer-level AlN substrate with high insulation and high thermal conductivity.



High quality adjustable light color light source module

Color μ LED array display panel grain photo



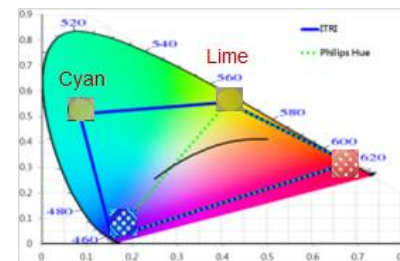
8-inch AlN LED Chip Wafer



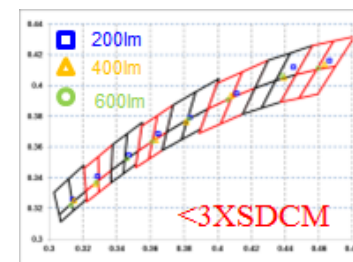
8-inch wafer-level AlN substrate

We devote into domestically development of optoelectronic semiconductor module technologies, enhance the competitiveness of Taiwan semiconductor industry in the world. This project aims to establish an interactivable intelligent lighting environment including core technologies of high-value smart lighting and micro-LED light source in wearable devices to lead LED lighting upgrade to smart optical service industry. Also, the development of insulating AlN substrate with high thermal conductivity and critical metallization package technologies, accelerate the implementation of popularization of LED lighting and construction of intelligent light industry ◦

- The spectrum adjustable modules is an internal leading technology which value added the LED lighting products.
- The world's leading R/G/B micro-LED chip array chip development, can be used in applications of high brightness, energy saving display panel mobile devices.
- 8-inch wafer-level AlN substrates, which go hand-in-hand with MARUWA's technology, allow the introduction into power electronic components that dramatically improve the thermal performance, optoelectronic efficiency and high-temperature environmental reliability of the devices.



Narrow spectrum monochromatic LED + wide spectrum pc-LED spectral design



Light color control accuracy verification