中山大學電機系 李明達

(1) 學經歷

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(4) 附件 1 S. M. Sze, M. K. Lee, “Semiconductor Devices Physics and Technology 3rd”教課書封面（2011 年 6 月出版）

附件 2 聯合報健康版 打倒惡視力本文及迴響(99 年 7 月 28 日)

附件 3 重要研究成果特別報導

學 經 歷

中山大學電機系 李明達

一、學歷

國立成功大學電機系博士(博字第 0102 號, 1983.4.16) 1979.9-1983.4

國立成功大學電機系碩士 1977.9-1979.6

私立中原理工學院電子系學士 1971.9-1975.6

二、經歷

工業技術研究院電子研究所工程師 1979.6-1979.9

交通部電信局數據通信所高級技術員 1981.7-1981.9

國立中山大學電機系兼任講師 1982.8-1983.7

國立中山大學電機系副教授(副字第 8710 號, 1983.8) 1983.8-1988.5

美國電話電報公司貝爾實驗室訪問學者 1987.8-1988.8

國立中山大學電機系教授(教字第 5255 號, 1988.5.30) 1988.5-至今

國立中山大學電機所所長 1988.8-1993.7

國立中山大學電機系系主任 1989.8-1993.7

三、專長

半導體磊晶工程，光電半導體工程，積體電路工程，電子工程，奈米材料

四、資格

1. 民國 69 年全國性公務人員高等考試電機科及格[(六九)(二)全高字第 236 號)]暨電機技師及格[(六九)專高字第 215 號)]。
2. 民國 69 年特種考試交通事業電信人員高級技術員甲組電機考試及格[(六九)特交電字第 102 號]]。

五、教育

1. 教育部 77 學年度大學暨獨立學院教學特優教師獎。
2. 82 年度國立中山大學優良導師獎。
3. 87 年度國立中山大學電機系優良教學獎。
4. 94 年度國立中山大學電機系優良教學獎。
5. 94 年度國立中山大學傑出教學獎。

六、學術

1. 國立中山大學 78、79 學度傑出研究獎。
2. 國科會五次優等研究獎助。國科會十次甲等研究獎助。
3. 指導碩士論文於 76、81、82 學年度分獲中國電機工程師學會青年論文獎第一名、第二名、第一名。
4. 82 學年度獲全錄學術優等論文指導獎。
5. 82 學年度獲龍騰學術優等論文指導獎。
6. 86 年 6 月獲中國電機工程師學會高雄分會傑出工程師獎。
7. 中國電機工程師學會傑出電機工程教授獎。(2006 年)
8. 中國工程師學會 97 年度傑出工程教授獎。(2008 年)
9. 國立中山大學 97 學度研究績優獎。(2008 年)

七、服務

1. 中國電機工程師學會正會員 (永 8647, 80.1) ，擔任中國電機工程師學會理、監事。
2. 中國工程師學會永久會員 (永 28579, 80.7) ，擔任中國工程師學會理、監事。
3. 中華民國電子材料與元件協會理事。
4. 高等考試命題委員。
5. 中國工程師學會傑出工程師，傑出工程教授評選委員。
6. 擔任中國工程師學會、中國電機工程師學會與中國機械工程師學會 84 年聯合年會籌備會主任委員。
7. 高雄市政府捷運局監督委員。
8. 八十七年公務人員普通考試分試第二試基本電學新建題庫召集人及審查委員。
9. 國家實驗研究院奈米元件實驗室諮詢委員。
10. 公費留學考試命題暨閱卷委員。
11. 國立科學工藝博物館展示廳顧問。
12. 九十六、九十七學年度國立中山大學校務基金管理委員會委員。

八、演講

機構	地點	時間	題目
密西根大學	美國密西根	**1990.12.14**	**III-V Compound Semiconductors Heteroepitaxy on Silicon**
工業技術研究院光電工業研究所	新竹	**1993.5.12**	**Development of II-VI Compound Blue LED & LD**
日本昭和電工公司	日本東京	**1996.3.8**	**Fabrication of ZnSe Blue LED**
中山科學院材發中心	桃園龍潭	**1996.4.25**	**ZnSe Blue LED**
中國工程師學會高雄分會	高雄	**1996.11.4**	工程教育
國立中山大學物理系	高雄西子灣	**1996.11.15**	**ZnSe Blue LED**
統懋半導體公司	台南新市	**1997.5.16**	**The Growth of LPD-SiO_2**
華邦電子公司	新竹科學園區	**1997.6.20**	**The Growth of LPD-SiON**
吳鳳工商專校	嘉義	**1997.10.7**	積體電路技術發展現況
大眾廣播電台	高雄	**1997.11.16**	我們現代人
慶聯有線電視-焦點高雄	高雄	**1998.1.21**	高雄市政回顧與展望-主持人
慶聯有線電視-焦點高雄	高雄	**1998.4.18**	兩性關係
國立高雄科學技術學院	高雄	**1998.10.16**	半導體工業現況與未來
港都廣播電台	高雄	**1998.12.13**	青少年九大問題
和春工商專校電子科研討會	高雄	**1999.4.8**	半導體發展
工業技術研究院光電所	新竹	**1999.9.15**	**Growth Chemistry and Thermodynamics of MOVPE**
中國電機工程師學會高雄分會	高雄	**2003.12.19**	奈米級二氧化鈦之應用
台灣大學物理系	台北	**2004.10.11**	奈米級二氧化鈦之應用
高雄大學應用物理系	高雄	**2004.10.20**	奈米級二氧化鈦之應用
長庚大學電子系	台北	**2006. 10. 24**	二氧化鈦與生活
高雄大學應用物理系	高雄	**2008.3.3**	可見光二氧化鈦及應用
高雄海洋科技大學微電子系	高雄	**2011.5.5**	台灣積體電路之發展

九、完成之研究計畫

計畫名稱	開始日期	結束日期	經費	補助單位
1.以低壓有機金屬化學氣相沉積法生長硒化鋅磊晶膜(NSC74-0608-E110-01)	04/01/85	03/31/86	276000	國科會
2.使用加成物以低壓有機金屬化學氣相沉積法生長磷化銦磊晶膜(NSC75-0608-E110-01)	04/01/86	03/31/87	730000	國科會
3.使用有機金屬化學氣相沉積法生長矽異質磊晶膜(NSC76-0404-E110-01)	08/01/86	07/31/87	37000	國科會
4.在矽基板上使用有機金屬化學汽相沉	04/01/87	03/31/88	635000	國科會

積法生長硒化鋅異質磊晶膜(NSC76-0608-E110-01)

5.在矽晶片上以有機金屬化學氣相沉積法進行磷化銦之異質磊晶工程 (I) (NSC78-0417-E110-01) 08/01/88~07/31/89 900000 國科會

6.在矽基板上使用有機金屬氣相沉積法生長硫化鋅異質磊晶膜 (NSC78-0417-E110-02) 02/01/89~01/31/90 403000 國科會

7.使用加成物以有機金屬化學氣相沉積法生長砷化銦鎵磊晶膜(NSC79-0417-E110-01) 08/01/89~07/31/90 965000 國科會

8.在矽晶片上以有機今屬化學氣相沉積法進行磷化銦之異質磊晶工程 (II) 02/01/90~01/31/91 703000 國科會

9.在矽晶片上進行砷化鎵金—半場效電晶體之研製 08/01/90~07/31/91 808000 國科會

10.在矽基板上異質磊晶硫化硒鋅三元化合物(NSC80-0417-E110-02) 02/01/91~01/31/92 729000 國科會

11.磷化銦場效電晶體之研製 (NSC81-0417-E110-01) 08/01/91~07/31/92 1110000 國科會

12.藍色發光二極體之研究 (I) (NSC82-0417-E110-031) 07/01/92~06/30/93 1331000 國科會

13.無序／有序／無序磷化銦鎵紅色發光二極體之研製(NSC82-0417-E110-090) 02/01/93~01/31/94 499000 國科會

14.藍色發光二極體之研究 (II) (NSC83-0404-E110-008) 08/01/93~07/31/94 705000 國科會

15.液相氧化膜沉積技術 (I) （產學案） (NSC79-0414-E110-001) 02/01/94~01/31/95 1531000 國科會
02/01/94~01/31/95 450000 華隆微

16.寬頻、高檢測力的多孔矽光檢測器之研究 (I) (NSC83-0417-E110-007) 02/01/94~01/31/95 621000 國科會

17.寬頻、高檢測力的多孔矽光檢測器之研究 (II)(NSC84-2215-E110-008) 02/01/95~07/31/95 206000 國科會

18.液相氧化膜沉積技術 (II)（產學案） (NSC84-2622-E110-003) 02/01/95~01/31/96 1961000 國科會
02/01/95~01/31/96 450000 華隆微

19.以有機金屬化學氣相沈積法磊晶成長硫硒化鋅三元化合物 (I) (NSC84-2215-E110-012) 08/01/95~07/31/96 868300 國科會

20.以有機金屬化學氣相沈積法磊晶成長硫硒化鋅三元化合物 (II) (NSC85-2215-E110-010) 國科會

21.液相氧化膜沉積技術 (III)（產學案） (NSC85-2622-E110-003R) 02/01/96~01/31/97 1558500 國科會
02/01/96~01/31/97 450000 華隆微

22.以有機金屬化學氣相沈積法磊晶成長硫硒化鋅三元化合物 (III) (NSC86-2215-E110-008) 08/01/96~07/31/97 843000 國科會

23.以有機金屬化學氣相沈積法磊晶成長 08/01/97~07/31/98 848000 國科會

硫硒化鋅鎂四元化合物(I) (NSC87-2215-E110-007)

24.動態記憶體中高介電鈦酸鍶鋇　08/01/97~07/31/98　939100 國科會
〔ＢＳＴ〕薄膜電容之研發－
子計畫一：研製鈦酸鍶鋇薄膜材
料之 MOCV 系統及薄膜成長(I) (NSC87-2215-E110-011)

25.一種液相二氧化鈦(LPD-TiO_2)沉積方法　08/01/97~07/31/98　552000 華邦電

26.以有機金屬化學氣相沈積法磊晶成長　08/01/98~07/31/99　1100200 國科會
硫硒化鋅鎂四元化合物(II) (NSC88-2215-E110-007)

27.動態記憶體中高介電鈦酸鍶鋇　08/01/98~07/31/99　651900 國科會
〔ＢＳＴ〕薄膜電容之研發－子計畫一：研製鈦酸鍶鋇薄膜材
料之 MOCV 系統及薄膜成長(II)(NSC88-2215-E-110-013)

28.以有機金屬化學氣相沈積法磊晶成長　08/01/99~07/31/2000　996400 國科會
硫硒化鋅鎂四元化合物(III) (NSC89-2215-E110-002)

29.動態記憶體中高介電鈦酸鍶鋇　08/01/99~07/31/2000 1028200 國科會
〔ＢＳＴ〕薄膜電容之研發－子計畫一：研製鈦酸鍶鋇薄膜材
料之 MOCV 系統及薄膜成長(III) (NSC89-2215-E-110-024)

30. 氮化鎵晶片金屬接觸特性之研究　05/01/00~4/30/01 200000 佳大公司

31. 以液相沉積法生長氧化鈦矽薄膜　08/01/01~07/31/02 691200 國科會 (NSC 90-2215-E-110-030)

32. 以 MOCVD 成長 ZnSSe 自聚性　08/01/01~07/31/02 1961200 國科會
量子點 (1/2) (NSC 90-2215-E-110-035)

33. 氮化鎵晶片金屬接觸特性之研究　05/01/01~04/30/02 200000 佳大公司

34. 以 MOCVD 成長 ZnSSe 自聚性　08/01/02~07/31/03 1820800 國科會
量子點 (2/2) (NSC 91-2215-E-110-013)

35. 利用 TiO2 爲閘氧化層製作 Si　08/01/03~07/31/03, 1,346,800　國科會
與 InP MOSFETs(1/3) (NSC 92 - 2218 - E - 110 - 002 -)

36. 以液相沈積法製作奈米結構　08/01/03~07/31/04, 1,604,800 國科會
二氧化鈦氣體感測器(I) (NSC 92 - 2215 - E - 110 - 014 -)

37. 以液相沈積法備製奈米電致　01/01/04~12/31/04, 459800 國科會
變色玻璃之研究 (NSC 93-ET -7-110-002-ET)

38. 利用 TiO2 爲閘氧化層製作 Si　08/01/04~07/31/05, 1,358,600 國科會
與 InP MOSFETs(2/3) (NSC 93-2215-E-110-009)

39. 以液相沈積法製作奈米結構　08/01/04~07/31/05, 1,342,800 國科會
二氧化鈦氣體感測器(II) (NSC 93-2215-E-110-003)

40. 奈米矽發光二極體之研製　01/01/05~12/31/05, 656,800 國科會
(94-2623-7-110-004-)

41. 利用 TiO2 爲閘氧化層製作 Si 與 InP　08/01/05~07/31/06　1, 168,000　國科會
MOSFETs (3/3) (94-2215-E-110-023-)

42. 使用 TiO2 爲薄膜電晶體閘高介電常數介質及 SiOF 爲金屬間低介電常數介質於 TFT/LCD 之研製 (1/3) 08/01/05~07/31/06 1, 188,000 國科會
(NSC 94-2215-E-110-020-)
43. 使用 TiO2 爲薄膜電晶體閘高介電常數介質及 SiOF 爲金屬間低介電常數介質於 TFT/LCD 之研製 (2/3) 08/01/06~07/31/07 1, 506,000 國科會
(NSC 95-2221-E-110-107-)
44. 以原子層沈積技術生長高品質二氧化鈦膜爲閘極氧化層製作 Si 與 III-V MOSFETs (1/3) 08/01/06~07/31/07 1, 120,000 國科會
(NSC 95-2221-E-110-109-MY3)
45. 使用 TiO2 爲薄膜電晶體閘高介電常數介質及 SiOF 爲金屬間低介電常數介質於 TFT/LCD 之研製 (3/3) 08/01/05~07/31/06 x,xxx,xxx 國科會
(NSC 96-xxx-E-110-xxx-)
46. 以原子層沈積技術生長高品質二氧化鈦膜爲閘極氧化層製作 Si 與 III-V MOSFETs (2/3) 08/01/07~07/31/08 1, 373,000 國科會
(NSC 95-2221-E-110-109-MY3)
47. 以原子層沈積技術生長高品質二氧化鈦膜爲閘極氧化層製作 Si 與 III-V MOSFETs (3/3) 08/01/08~07/31/09 1, 396,000 國科會
(NSC 95-2221-E-110-109-MY3)
48. 生長氧化鋅奈米柱結構及相關光電元件之製作(1/3)
08/01/08~07/31/09 1, 336,000 國科會
(NSC 97-2221-E-110-073-MY3)
49. 生長氧化鋅奈米柱結構及相關光電元件之製作(2/3)
08/01/09~07/31/10 1, 536,000 國科會
(NSC 97-2221-E-110-073-MY3)
50. 研製具超薄二氧化鈦閘極氧化層之磷化銦金氧半電晶體(1/3)
08/01/09~07/31/10 793,000 國科會
(NSC 98-2221-E-110-073-MY3)
51. 生長氧化鋅奈米柱結構及相關光電元件之製作(3/3)
08/01/10~07/31/11 1, 536,000 國科會
(NSC 97-2221-E-110-073-MY3)
52. 研製具超薄二氧化鈦閘極氧化層之磷化銦金氧半電晶體(2/3)
08/01/10~07/31/11 908,000 國科會
(NSC 98-2221-E-110-073-MY3)
53. 研製具超薄二氧化鈦閘極氧化層之磷化銦金氧半電晶體(3/3)
08/01/11~07/31/12 1, 281,000 國科會
(NSC 98-2221-E-110-073-MY3)

對本院整體發展之意見

中山大學電機系 李明達

教學、研究、服務是教授的工作核心，能得天下英才而教之，不亦快哉，能得天下英才而指導研究，不亦快哉，如何能得天下英才是當前院系最重要的工作。

科技不斷創造、發展、整合，各學系內涵不斷多樣、演化，在現有架構下，教授之教學研究工作與學生課程負擔愈行沉重，教授能快樂有效地進行教學、研究、開發資源、形成特色，學生能快樂有效學習、入寶山滿載而歸等，成為大家努力的事項，更是院長一職全力以赴的工作，茲提出發展願景與同仁們共同攜手向前邁進：

1. **提昇教學品質、投入更多研究時間**—建立教學研究好環境。
2. **主動爭取與業界合作**—開發資源，吸引學生學習進修意願
3. **多設專業學程**—使學生有專業及系統概念。
4. **各系發展上定位特色**—集中力量爭取認同。
5. **因應時事舉辦座談**—建立權威形象。
6. **爭取大師級學者來校講課**—提升學習動力。
7. **編寫教課書**—有效學習並增加知名度。
8. **建立共同實驗室**—展開能見度及研發窗口。
9. **爭取本校及優質學生來校就讀研究所**—提昇研究戰力。
10. **延續退休教授研究能量**—提昇研究人力資源。
11. **加強行銷**—增進認同。

茲說明如下：

1. 時間與效率是一切的基本元素，能節省時間增加效率就能邁向卓越。教授能教最專精的部份，學生就可得到最有效的學習。教授減輕教學負擔，就有更多的時間投入研究。例如必修課兩班合班上課，一學期中兩位教授僅就自己最專精的部份教半學期，就可達到該等目地，自然提昇教學品質，投入更多研究時間，發展特色。
2. 業界具有就業與研發資源，主動積極爭取與其合作，教授可參與業界研發部門研究，增加研發資源，同時減緩研究空間等問題。與業界合作下可導引教授研發與工業現況結合，使業界了解教授能力，並使學生了解業界，除提升就職機會外，更提升學生與工程師進修意願，可得優質研究生共同參與研發。此外，研發必向系統化、產品化前進，產出更易取得資源、建立特色。

3. 多設專業學程如顯示器、IC 封裝、IC 工程、奈米科技、燃料電池等學程，學生在學習時能有專業感、系統概念及明確方向。
4. 各系發展與它校無異，規模又小，故需定位發展方向集中力量，建立特色，爭取認同。
5. 宣導是取得認同的第一步，因應時事參與或舉辦座談如工程、環保、教育、核電、經建等是宣導良好有效方式。增加工學院各系所知名度、社會地位與社會影響力。
6. 大師級學者來校開課除增加學習動力，若能共同指導研究生對研發發展，爭取資源，學生認同是有效方式之一。
7. 教授能將教學講義編寫為教課書，除有效學生學習迎接未來，並可提升教授、系、院、校知名度。
8. 建立窗口使學生了解教授研發工作，大型共同實驗室是有效了解窗口。
9. 優質研究生是研究能量重要一環，在建立研究特色，加強宣導後，定可取得學生進修意願提昇研究戰力。
10. 退休教授有幾十年研究經驗，大半在精神與體力上仍大有可為，在條件許可下，可延續為提昇研究人力寶貴資源。
11. 中山具有好山好水，更具一流師資及研究環境，加強行銷才能增進認同，。

上述事項配合各系所發展不僅創造快樂積極的研究學習環境，並能建立特色，取得學生與社會之認同，使教授能領導優質研究生盡情發揮，使學生提高學習品質更具活力，提昇整體能量。

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26. 一種高介電常數與低漏電流磷化銦金氧半電容的製作方法

中華民國專利發明 I 249841 號　　2006.2.21-2025.3.17

美國專利已公開(US-2007-0105399-A1)

27. 一種使用金屬化熱處理將低金屬/二氧化鈦半導體電容結構漏電流的製作方法

已獲中華民國專利發明 I 281190 號　　2007.5.11-2025.7.27

美國專利已公開(US-2007-0105374-A1)

28. 用於製備氧化鋅晶體生長方法

已獲中華民國專利發明 I 281522 號　　2007.5.21-2025.10.20

29. 具有自聚性量子點之半導體化合物用基板

A Substrate with Self-Assembled Quantum Dots for Semiconductor Compound

獲中華民國專利發明 I 292220 號　　2008.1.2-2026.4.20

30. 同時摻雜有氮與氟之氧化鈦顆粒的製造方法

Method for Preparing Titanium Dioxide Particles Co-doped with Nitrogen and Fluorine

獲中華民國專利發明 I311984 號　　2009.7.11-2026.3.27

美國專利 7,771,688 B2 號　　2010.8.10

31. 具有三氟氧鈦銨晶體之材料、其製備方法，及利用其來製備具有二氧化鈦晶體之材料的方法

A Media Having Crystals of Ammonium Oxotrifluorotitanate, A Method for Preparing The Same, and A Method for Preparing Madias Having Crystals of Titanium Dioxide。

獲中華民國專利發明 I 304048　2008.5.1 專利期限 2025/10/20

32. 應用高介電材料於薄膜電晶體之閘極氧化層的製作方法及其結構

獲中華民國專利發明 I 299186 號　　2008.7.21-2026.5.11

33. 同時摻雜有氮與氟之氧化鈦顆粒的製造方法/ A Method for Preparing Titanium Oxide Particle Incorporated with Nitrogen and Fluorine

台灣專利號 I 311984，公告生效日 2009/7/11，專利期限 2026/3/27

34. 具有異質接面之光觸媒顆粒及其製造方法/

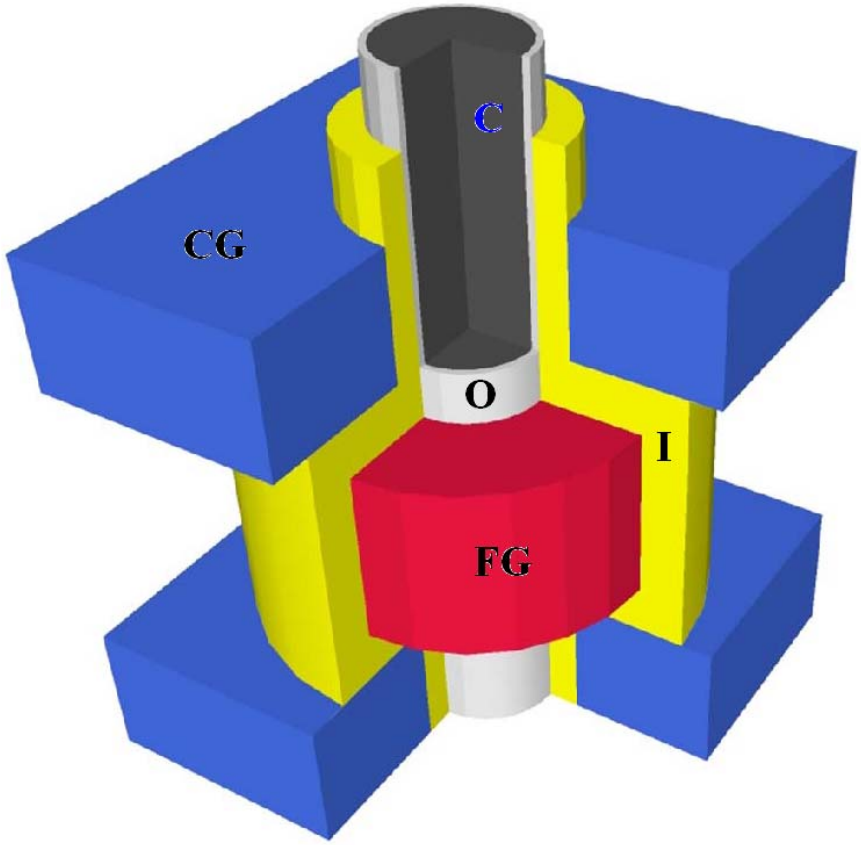
台灣專利號 I 329034，專利期限 2010/8/21~2026/4/3

附件 **1 2011年6月底出版之教課書封面(Wiley)**

Semiconductor Devices

Physics and Technology

3rd Edition



S. M. Sze **M. K. Lee**

附件 2 聯合報健康版 打倒惡視力本文及迴響(99 年 7 月 28 日)

聯合報 中華民國九十九年七月二十八日 星期三

他們得糖尿病 也有幸福人生

【記者施靜茹／台北報導】年紀輕輕就得糖尿病，生活少不了吃藥、注射胰島素，有人因此不敢結婚生子，但也是病人的糖尿病衛教師康婉玲，卻勇敢接受挑戰。

30歲的糖尿病衛教師康婉玲，18歲在醫院實習時，因血糖飆高引發嚴重氣喘，才知自己是第一型糖尿病患。

因為生病，她立志從事醫護工作，也順利當上糖尿病衛教師，本來抱定不結婚、不生子，但男友的體貼、包容，再加上準婆婆說：「健康的人不好好照顧自己，一樣生病。」她才放心結婚。

康婉玲順利懷孕，過程中，醫師也提醒，要好好控制血糖，避免忽高忽低，否則會影響小貝比器官的形成。所以她一天測6到8次血糖，想到就測，深怕一不小心，影響小孩發育，看到小女兒健康可愛，她覺得所有辛苦都值得。

康婉玲參加一項糖尿病徵文比賽，寫下治病心情，得到特優，昨天她領獎時說：「我如果不好好照顧自己，又如何說服病人要運動、控制飲食？」

另一位振興醫院糖尿病衛教師林靜莉，獲醫療團隊組特優，寫到得糖尿病的公公，原對治療興趣缺缺，這盡為人媳婦的無奈。

林靜莉說，公公常口渴、上廁所次數變多，一測血糖指數，高到300多，還說：「去病院，還要排隊、等號碼很麻煩，嘜去啦！」身為衛教師和媳婦的她，好說歹說，終於說服公公就醫。

當林靜莉責無旁貸擔任打針、驗血糖的工作，她公公潑冷水地說：「反正得這種病，一世人也不會好，我吃到這把年紀有夠啦，不用浪費那麼多時間，再去顧什麼健康啊！」最後是搬出要公公等著看孫子結婚理由，才讓公公接受治療。

打倒惡視力 避開UV和藍光

日光燈、LED燈 傷害視網膜細胞 保護眼睛 補充葉黃素、玉米黃質素

沈佳蓉／屏東輔英科大附設醫院眼科主治醫師
李明達／國立中山大學電機系教授

愛美的人都知道，不只曬太陽會變黑，躲在家裡待在日光燈下曬太久也會變黑，因為日光燈中有不弱的紫外光（UV）。我們的眼睛同樣也怕UV，許多眼部病變，如白內障、眼皮腫瘤、翳狀贅片、光角膜炎以及老人黃斑部退化等，都和UV有關。

選擇鏡片 也要避開藍色

日光燈除發出UV光外，還有大量藍光，藍光也是傷害眼睛的燈源之一。視網膜細胞中主要對光敏感的化合物有視紫質（rhodopsin）、紫質（opsin）與黑色素顆粒體（melanosomes）等，它們吸收藍光的能力遠超過

別讓嬰幼兒 直視燈源

夏日吃甜湯 糖尿病友

沈佳蓉／屏東輔英科大附設醫院眼科主治醫師

李明達／國立中山大學電機系教授

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藍光會激起這些視網膜細胞內化合物活動量，加速脂褐質（lipofuscin）、脂質（lipid）等化合物積聚於視網膜色素層中，有如雜質沉積於底片上，模糊視力。同時增加釋出有害自由基，傷害視覺細胞，加速老年性黃斑部病變。

所以建議不要在含有大量 UV 或藍光的燈源下長期閱讀；即使配戴太陽眼鏡、近視眼鏡或是隱形眼鏡，也以不選擇藍色鏡片爲佳。

近來大力提倡白光發光二極體（LED）照明， LED 產生白光的方式有二，一是由藍光 LED 中部份藍光經由螢光粉轉爲黃光再與剩餘藍光合成白光，另一則是使用 UV 經由紅、綠、藍螢光粉轉爲白光。兩種方式都含有大量的藍光或是 UV 光，製造廠商及使用者都須注意。

電腦螢幕 不宜長期使用

除燈具外，一般生活中接觸到藍光的部分有電玩、手機、個人電腦、液晶電視。這些用品中的螢幕都使用類似日光燈或 LED 當作背光源，都不宜長時間使用。

如何視力保健？視網膜中的黃斑部之所以爲黃色，是因爲組織內有含氧類胡蘿蔔素，尤其是葉黃素與玉米黃質素，這些類胡蘿蔔素都是抗氧化劑。由於人體無法自行合成這些類胡蘿蔔素，需藉由飲食補充，所以平時可多補充葉黃素及玉米黃質素保護眼睛。

深綠色、深黃色的蔬菜如菠菜、花椰菜等均富含有葉黃素，這些抗氧化劑在體內組成了防線，也有效過濾藍色的光線，減少光傷害，長期需曝曬在陽光下的人可以多吃。

其實，躲開 UV 及藍光是重要且直接的方法，建議早上 10 時到下午 2 時陽光最強的時間，減少戶外活動，避免長時間使用含 UV 及藍光的燈源。

別讓嬰幼兒 直視燈源

新生兒出生後，因視力還未發展完全，對發亮物體特別好奇，總喜歡盯著日光燈看，大人要格外小心預防。建議別讓嬰幼兒直視燈源。

50 年前教室及家庭燈源多半是採用鎢絲燈泡，無 UV 及藍光，而今日都採用非常明亮的日光燈，在照度充分的情況下，學童近視如此之多，其原因如視力活動空間縮小，看電視時間增加，燈源光譜的改變，在新生兒時期視力的損壞也是重要原因之一。

而省電燈泡，日光燈，LED 燈，電腦液晶螢幕的背光源，皆含有 UV 光以及藍光，也應儘量避免讓孩童直視，成人也是如此；也應至避免在日光強烈的環境下活動，或是配戴抗 UV 的太陽眼鏡。

眼睛是人類的靈魂之窗，需要你我從小保養與呵護。近代科技日新月異，生活中的燈源種類也一日千里。了解各種燈源的特性，以及對視力的影響，都是打倒「惡視力」應有認知。

附件 2 聯合報健康版 打倒惡視力迴響

李教授　您好:
拜讀您及沈佳蓉醫生的文章,打倒惡視力,真是深有同感!人類的眼睛是靈魂之窗,可是卻飽受各種不良燈具之傷害,除了 UV 和藍光之外,還有光的閃爍及電磁波輻射等問題.
在上個月 7/27 號,工研院舉辦的智慧照明發表會上,發表我的專利 LED(RGB)照明燈具,其中藍光部份只佔全部光源的 11%,並且無紫外線,紅外線等,特點如下列,
US PATENT: 7547113　相關簡報請看附檔.
打倒惡視力,須要更多的力量投入,才能化理論爲實踐,期盼您及沈醫生能共襄盛舉!造福人群,謝謝!(煩請轉寄沈醫生)

發明人:李維強
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附件 3 重要研究成果特別報導

Optics. Org

News

Sep 21, 2007

Blue LED emits stronger light

Optical components could benefit from a blue LED which offers enhanced coupling efficiency, stronger light emission, and a more uniform optical power output.

The team

Researchers from the Republic of China say that fabricating a Fresnel microlens onto the sapphire substrate of a blue LED enhances the optical power by around 1.68 times compared to the same device without the lens at a 20mA injection current. (*Applied Physics Letters* **91** 051111).

"The LED chip can emit 80mcd at 450nm under a current of 20mA," Ming-Kwei Lee, researcher at the National Sun Yat-Sen University, Republic of China, told *optics.org*. "The optical power output of conventional LEDs exhibit a Gaussian distribution. Our LED gives a flat distribution which means a more efficient coupling is obtained."

Incorporating a textured surface into LEDs made from gallium nitride has already been found to enhance its external quantum efficiency, but it is difficult to obtain directional light emission. By fabricating a Fresnel microlens array instead, the researchers have

obtained a more directional light enhancement. "The nearly flat surface of the Fresnel microlens also enhances the coupling efficiency with other optical components such as optical fibers without complicated alignment," added Lee.

The key to obtaining increased power output from the sapphire substrate is due to the difference in refractive indices of the materials. "There is a smaller difference in the refractive index between sapphire (1.76) and air, compared to between GaN (2.5) and air," explained Lee. "This means fabricating the microlens on the sapphire side provides a higher external quantum efficiency and greater emission area."

The researchers used a focused ion beam (FIB) milling technique to fabricate the Fresnel microlens structure onto the sapphire. The technique involves a one-step machining process by computer program.

"The sophisticated etching skill we have achieved cannot be obtained using other technologies," commented Lee. "The method uses accelerated gallium ions to etch the target. The path and energy of the charged gallium ions can be well controlled by the electric field."

The researchers will next investigate how the overall power output is affected by introducing a Fresnel lens to different faces of the LED. "We will fabricate a Fresnel lens onto the GaN face and onto the sides of a blue GaN to check the overall output power," concluded Lee. "We will also explore suitable packaging for this type of LED."

About the author

Marie Freebody is a reporter for *Optics and Lasers Europe* and *optics.org*.

PHOTONICS SPECTRA

Technology World | October 2007
For a Little Light, a Microlens

Fresnel microlenses fabricated in single step.

by Hank Hogan

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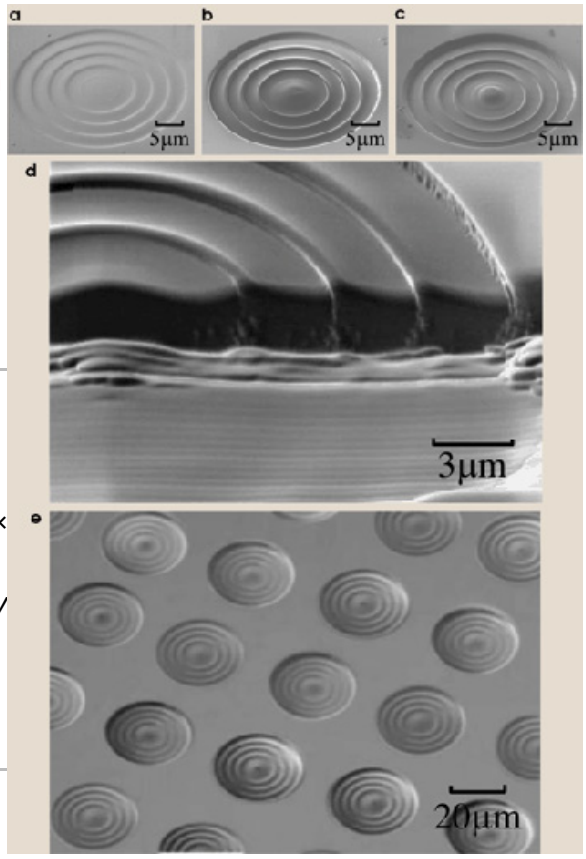
Gallium nitride LEDs are useful but suffer from a significant drawback: Their external quantum efficiency is low because the refractive index of GaN, which is 2.5, is very different from that of air, 1.0. Putting GaN on a sapphire substrate (refractive index 1.76) lessens the difference and increases the efficiency. Texturing the sapphire's back side provides a further boost.

Now a group of researchers from National Sun Yat-Sen University in Kaohsiung, Taiwan, has demonstrated a technique that produces a Fresnel microlens on the sapphire back side in a single step. The method, or variations of it, could improve the performance of GaN LEDs.



Scanning electron photographs show Fresnel microlenses milled into the back side of a sapphire substrate with a focused ion beam at dose densities of 7.0 × 10^{17} ions/cm^2 (a), 2.3 × 10^{18} ions/cm^2 (b) and 3.5 × 10^{18} ions/cm2 (c). A close-up (d) shows more surface detail of the microlens in (b). Researchers used an array of Fresnel microlenses to increase the optical power output of a GaN blue LED (e). Reprinted with permission of the American Institute of Physics.

The group used focused ion beam milling, in which a stream of gallium ions strikes a surface, milling it away at the point of impact. By moving the point, features can be carved into a surface. Although any structure can be built, in theory, the researchers chose to create Fresnel microlenses. A Fresnel lens, unlike other refractive focusing elements, is nearly flat, making it easier to integrate with other optical components. It also requires less

milling than other possible optics.

Peaks and valleys

The scientists fabricated a blue GaN LED, depositing the thin-film device on a sapphire substrate. They used a focused ion beam system from FEI Corp. of Hillsboro, Ore., moving the milling spot in an annular pattern while varying the beam energy to create a Fresnel microlens on the back side of the substrate (see figure). The resulting structure consisted of a series of peaks where the original material remained. The peaks were interspersed with valleys where the material had been removed. The depth of the valleys was less than 0.5 μm, and the width of the entire lens was about 30 μm.

The researchers repeated the fabrication process, leading to a microlens array that stepped across the entire LED. They measured the result using a silicon photodiode from Otsuka Electronics of Osaka, Japan, comparing the output of an LED incorporating the microlens array to one without the lenses. They found the spectra to be about the same for the two, with a peak output around 460 nm. For an injection current of 20 mA, they found devices with the Fresnel microlens to be about 1.68 times as optically intense as those without.

The investigators noted that focused ion beam milling allows the construction of complicated Fresnel microlenses without masks or other processing steps. The technique enables alterations in structure design, with a change in the program controlling the focused ion beam.

The microlens array can increase the LED emission area and make the optical output power more uniform. Plans include fabricating a Fresnel lens on the LED side to enhance the output further. Other studies also are planned, noted professor of electrical engineering Ming-Kwei Lee.

“The coupling efficiency between the LED and fiber and a package suitable for this kind of LED will be studied,” he said.

Applied Physics Letters, July 30, 2007, Vol. 91, 051111.