50 Years of SID Symposia – Nurturing Progress in EL and OLED Technologies

1960's

Monochrome EL/OLED Products

1965
First TFEL
Matrix Display
Sigmatron

1967
Double Insulator
TFEL Structure
(M.Russ, D. Kennedy)
U. of Toronto

EL/OLED Phosphor

1968
First Rare Earth
Doped EL Phosphor
(D. Kahng)
Bell Labs

Mid 1960's - 1970's
Pope, Helfrich, Schneider, Schadt, Williams, Dresner
Organic El/molecular crystals - anthracenes
NRC (Canada), RCA

Color EL/OLED Products

AMEL/AMOLED Prototypes

Please note…

The panel on the left provides a high level historical overview of the progress in electroluminescent (EL) and organic light emitting diodes (OLED) technologies over the past 40 years. For clarity, the material is organized to present the first-of-a-kind **signifilcant technology and product milestones** separately for monochrome and color EL and OLED developments. Active matrix driven EL and OLED (AMEL/AMOLED) display prototypes are shown as a separate group, since many of the larger devices in the milestones have not transitioned to high volume production for the commercial market.

Contributors to initially generating (2003) and in 2010/12 updating this Milestone Technology Chart

EL 2003 & 2010 revision – **Chris King (chief architect)**, Richard Tuenge

OLED 2003 & 2012 revision – **Ching Tang (chief architect)**, Julie Brown

1970's

Monochrome EL/OLED Products

1974
Long Life/High
Brightness Display
(T. Inoguchi)
Sharp

1974
First TFEL TV
Sharp

EL/OLED Phosphor

1987
Tang/VanSlyke paper on
bilayer diode structure OLED
KODAK

Color EL/OLED Products

1975-F
First TFEL Active
Matrix EL Display
P. Brody
Westinghouse

1980's

Monochrome EL/OLED Products

1982
High Contrast
Military TFEL Display
(J.Tannas)
Aerojet

1983 - First TFEL Portable
Computer Display
Sharp
Airport Flight Status Display
Planar

1984
TFEL Device
Physics Model
(P. Alt)
IBM

1985
Split Electrode
TFEL Panel
(C. King, R. Flegal)
Planar

1989
First TFEL
Workstation Display
Planar

EL/OLED Phosphor

1980
First Atomic ZnS:Mn Layer
Deposition TFEL Device
(T. Suntola, A. Pakkala)
Planar

1984
SrS:Ce Blue
TFEL Phosphor
(C. King)
Planar

Color EL/OLED Products

1986
First Multicolor
Prototype
Planar

1987 – First Full Color
TFEL QVGA Prototype
Planar
Color by White
(S. Tanaka, H. Kobayashi)
Tottori U.

AMEL/AMOLED Prototypes

EL and OLED Technologies - SID Award Recipients

Karl Ferdinand Braun Prize

Toshio Inoguchi	1988
Shuji Nakamura	2004
Christopher King	2006

Jan Rajchman Prize

Steve Van Slyke*	2001
Ching Tang*	2001
Richard Friend*	2005
Jeremy Burroughes*	2005
Donald Bradley*	2005
Stephen Forrest*	2006
Mark Thompson*	2006
Tetsuo Tsutsui*	2012

Fellows

Sanai Mito	1976
Aron Vecht	1979
Elliot Schlam	1981
Howard E. Webster	1983
Larry Tannas, Jr.	1983
Christopher King	1990
Chuji Suzuki	1993
P. Niel Yocom	1998
Shosaku Tanaka	2001
Ching Tang*	2002
Steve Van Slyke*	2006
Chin-Hsin (Fred)Chen*	2006
Mike Hack*	2007
Myung Hwan Oh*	2007
Chishio Hosokawa*	2008
Junji Kido*	2008
Amal Ghosh*	2009
Julie Brown*	2011
Xiao Wei Sun*	2011
Ho Kyoon Chung*	2012

SID Special Recognition Award

Aron Vecht	1976
Toshio Inoguchi	1983
Chuji Suzuki	1983
Shosaku Tanaka	1993
T. Thoma*	2000
Junji Kido*	2002
Amal Ghosh*	2003
Noburu Miura	2003
Hideki Asada*	2006
Ho-Kyoon Chung*	2006
Walter Riess*	2007
Takatoshi Tsujimura*	2007
Kiyoshi Yoneda*	2008
Gary Jones*	2009

* OLED Technology

1990's

Monochrome EL/OLED Products

1994
First Monochrome
TDEL Display
(X. Wu)
iFire

1994
Integrated High
Contrast Electrodes
(E. Dickey)
Planar

1997
First Monochrome
PM-OLED display product
Pioneer

EL/OLED Phosphor

1993
Thiogallate Blue
TFEL Phosphor
(R. Tuenge, S. Sun)
Planar

1997
SrS:Cu, TFEL Phosphor
(S. Sun)
Planar

1997
SrS:Ce, Ag
Blue TFEL Phosphor
Heinrich-Hertz Institute

1999
$BaAl_2S_4$:
Eu Blue Phosphor
(N. Miura)
Meiji U.

1990
Nature paper on PLED
using conjugated polymers
(Friend et al)
Cambridge

1998
OLED with phosphorescent
emitters (Forrest, Thompson)
Princeton/USC

Color EL/OLED Products

1997
First Color
TDEL Display
iFire

1993
First Multicolor
TFEL Product
Planar

1997
Color by White
QVGA TFEL Display
Planar

1999
First PM-OLED
display product
Pioneer

AMEL/AMOLED Prototypes

1994
First AMEL
on Si Wafer
**Planar/Sarnoff/
Allied/Kopin**

1996
12 Micron
Pixel AMEL
**Planar/Sarnoff/
Allied/Kopin**

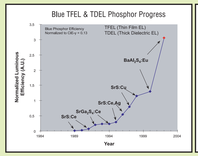
1996
First Color
AMEL Display
Planar

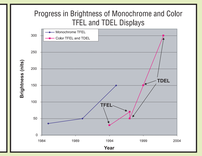
1996
First AMOLED
demonstration (QVGA)
TDK

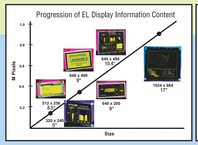
2000-2012

Monochrome EL/OLED Products

2000
Transparent
EL Products
Denso/Planar

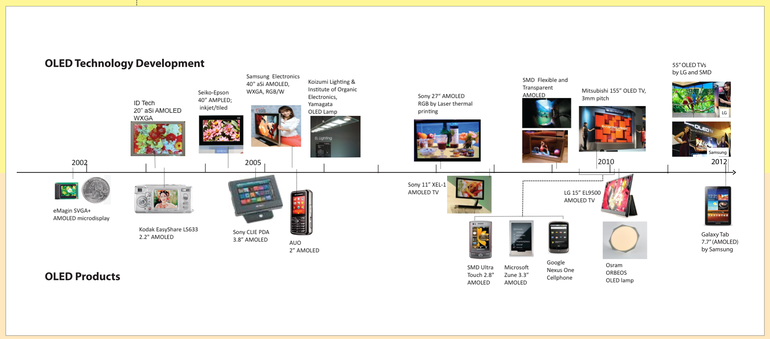






Color EL/OLED Products

2002
17" Full
Color TDEL Display
iFire

2002
Filterless
TDEL Display
TDK

AMEL/AMOLED Prototypes