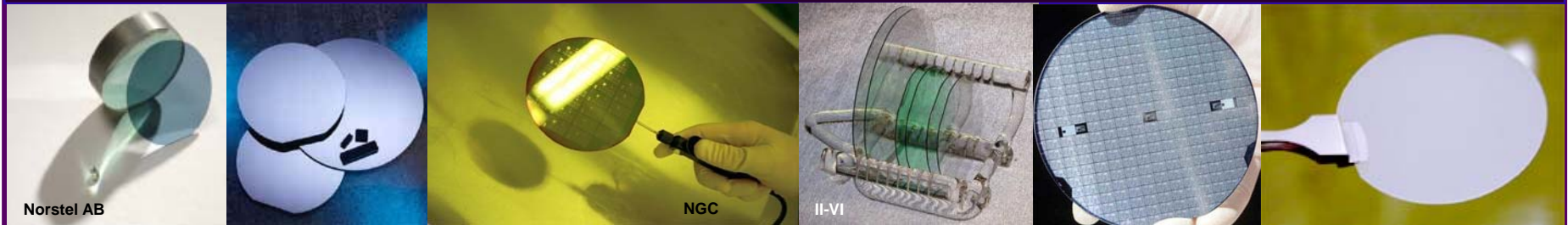


CS materials market' 08

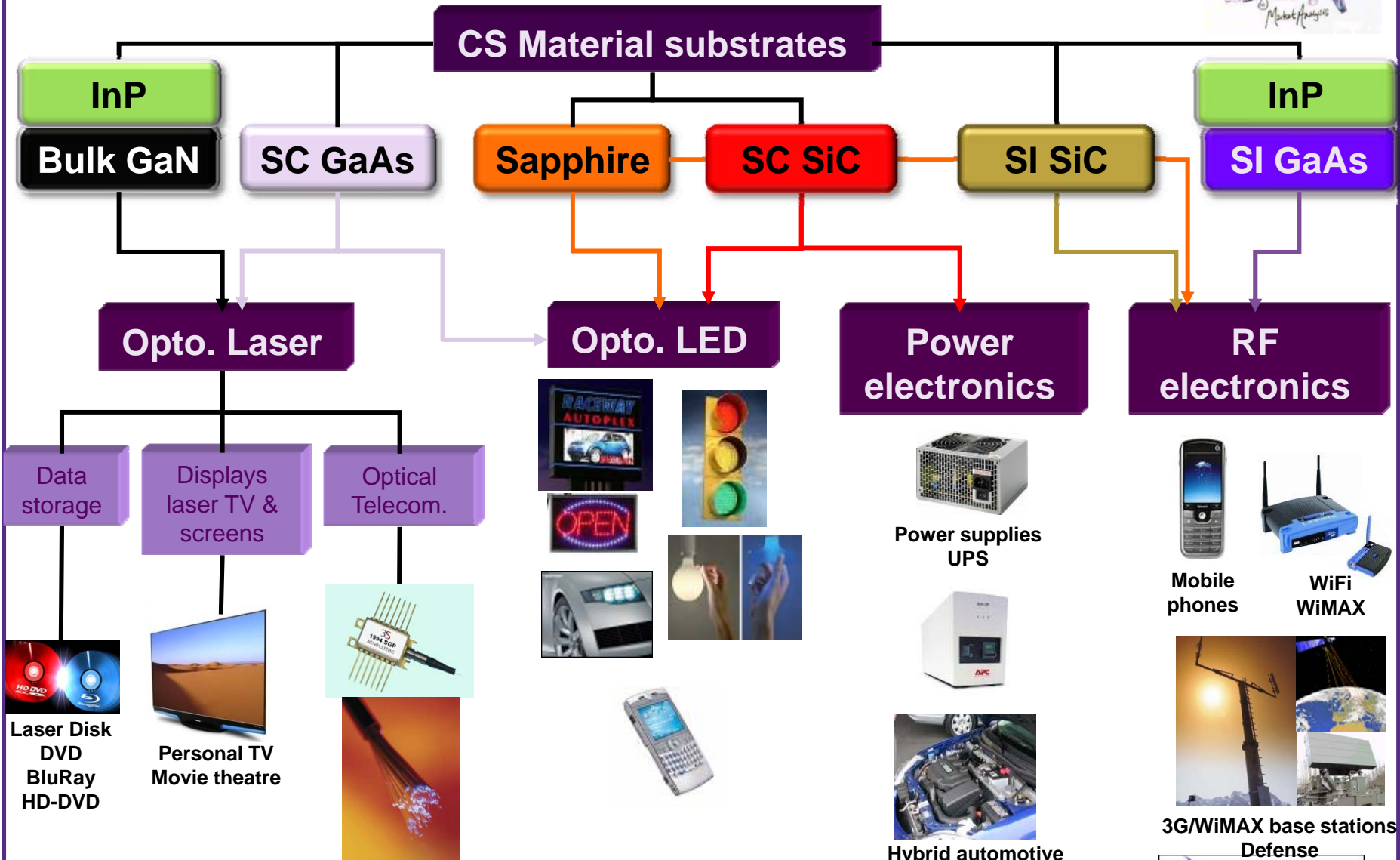
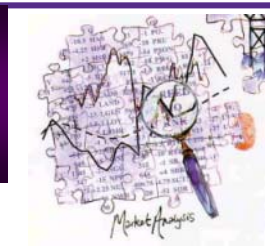
"A comprehensive survey on GaAs, InP, SiC, Sapphire and GaN material usages and markets"



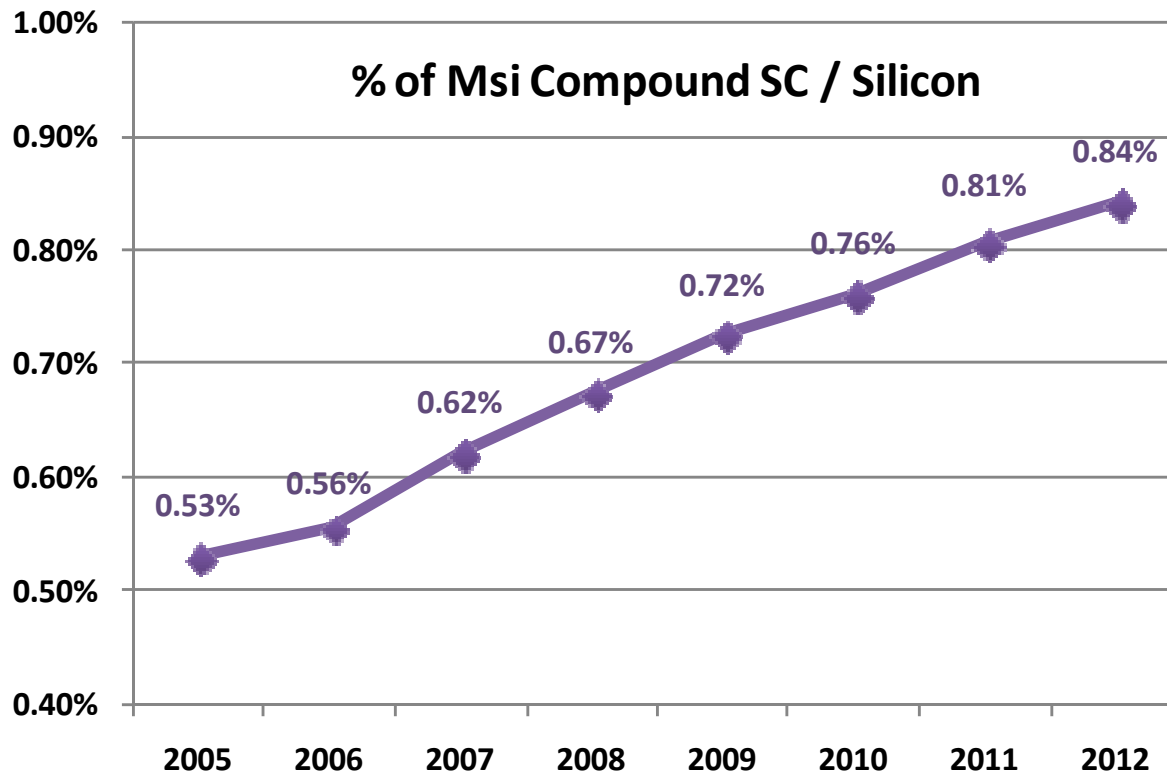
YOLE DÉVELOPPEMENT

45 rue Sainte Geneviève, F-69006 Lyon, France
Tel : +33 472 83 01 80 - Fax : +33 472 83 01 83
Web: <http://www.yole.fr>

CS material substrate applications segmentation



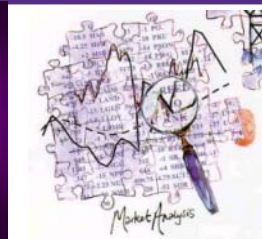
Evolution of CS materials consumption over silicon



**Compound semiconductors material is gaining market shares over silicon
CS electronic devices is increasing its market penetration in:**

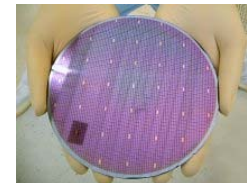
- **Power electronics: SiC and GaN slowly replacing some Si devices**
- **Huge growth rate of AlGaInP and AlInGaN LED segment (No Silicon here !)**
- **RF electronics: GaN HEMT to partially replace Si LDMOS**

2007 bulk CS wafers average market price



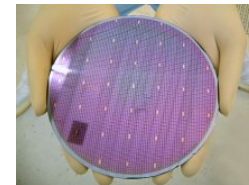
	2"	3"	4"	6"
S.I. GaAs	\$XX	\$XX	\$XXX	\$2XX
S.C. GaAs	\$XX-XX	\$XX	\$1XX	
Sapphire LED	\$19-\$35	\$XX	\$XXX	
Sapphire SoS				\$5XX
S.C. SiC	\$XXX	\$X00	\$X,XXX	
S.I. SiC	\$X,XXX	\$X,100		
Bulk GaN	\$X,900 - \$X,500	sampling		
InP	\$XXX	\$380	\$XXX	

GaAs substrate vendors growth technique and products

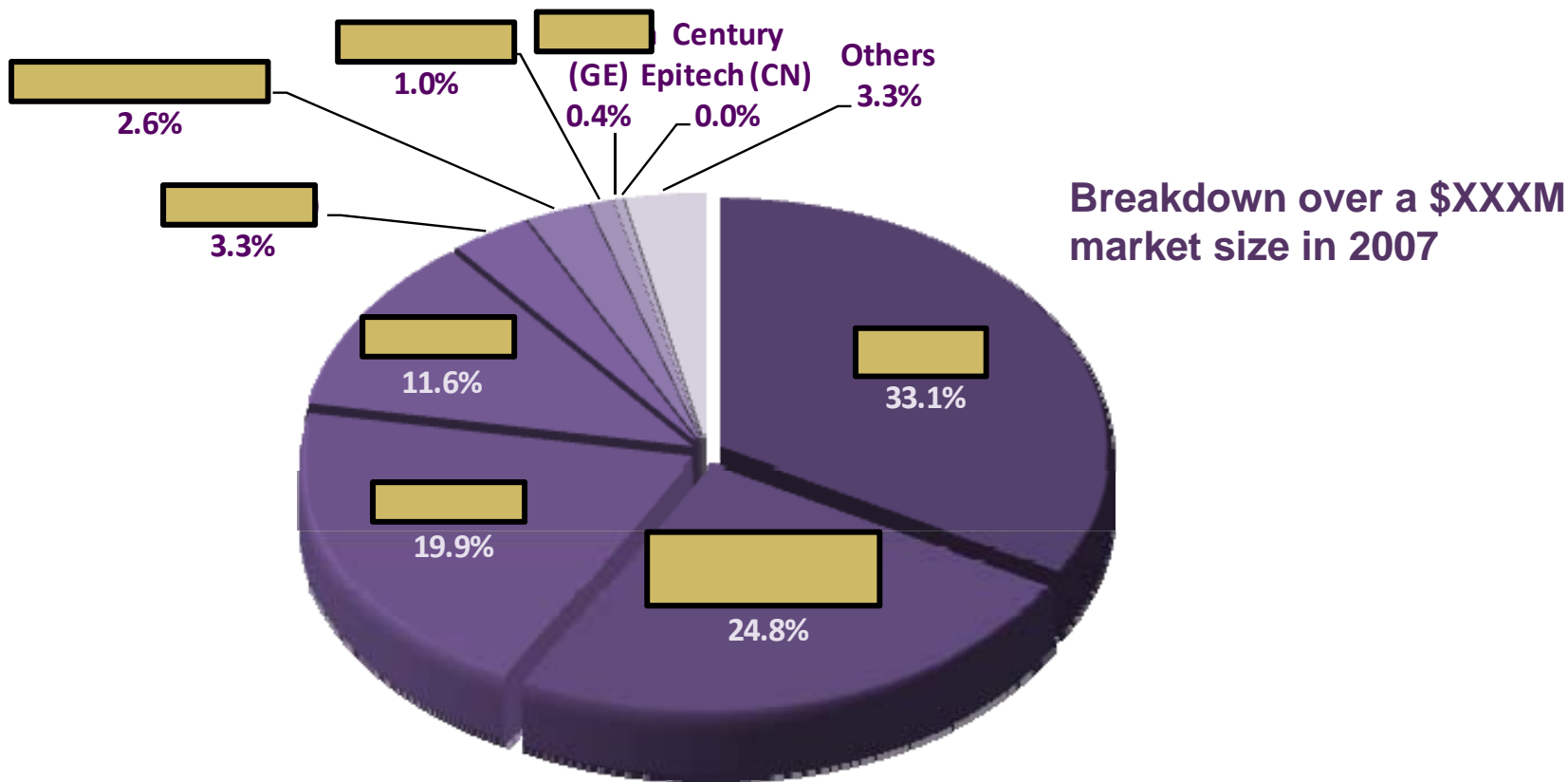


Company	V(H)GF		V(H)B		LEC		Dimensions	Orientations	Others
	SI	SC	SI	SC	SI	SC			
Sumitomo SEI (J)			X	X	X	X	Diam; : 100±0.3mm 150±0.3mm Thickness: 0.625±0.25mm 0.675±0.25mm	(1 0 0) ± 0.3°	
Hitachi Cable (J)	X	X		X	X		World's longest ø 3", ø 4" , ø 6" crystals		
AXT (US / CN)	X	X					Diam.: 2/3/4/6" Thickness : 350/625/625/675 µm ±25	(1 0 0) ± 0.5°	No 6" wafers available for SC GaAs
Freiberger FCM (D)	X	X			X	X	Diam. : 3"/100/125/150 mm		No 3" nor 125 mm for SI VGF Only 3" (LEC) & 100mm (VGF) for SC GaAs

2007 GaAs epiwafer vendors market share



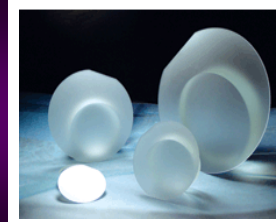
2007 GaAs epiwafer vendors market share



Merchant only.
Includes both RF and Opto related businesses

LED Market Generalities

Market segmentation



	Conventional LED	High Brightness LED	Ultra-high brightness white LED
Specifications	<ul style="list-style-type: none"> • 350x350 μm die • 30 mA, 3.5 V supply • < 200 mW power • External QE ~20% • 20 lm/W • 1 to 3 lm generated • Typical epoxy housing 	<ul style="list-style-type: none"> • Up to 1x1 mm² die • 350 mA, 3.5 V supply • Up to 1 Watt power • External QE > 30% • > 30 lm/W • 5 to 30 lm generated • Specific packaging 	<ul style="list-style-type: none"> • Up to 2x2 mm² die • > 50A/cm² • up to 5 watt power • External QE > 30% • > 50 lm/W • > 100 lm generated • CRI ~ 80 • Specific packaging
Application markets	<ul style="list-style-type: none"> • Mobile-phones keypad lighting • Mobile-phones backlighting • Signs 	<ul style="list-style-type: none"> • Screens backlighting • Automotive dashboard backlighting • Automotive: front headlamps • Large displays 	<ul style="list-style-type: none"> • Automotive head-lamps • High-End apps • General Illumination
ASP for packaged LED devices in large volume (> 10,000 units)	0.6\$ to 0.20\$ / part	0.8 to 2\$ / part	<ul style="list-style-type: none"> • Marketed since 2006 • 30\$/klm • ~\$3 for a 100 lm packaged LED

2007 sapphire substrate market for LED: price, units and diameter analysis

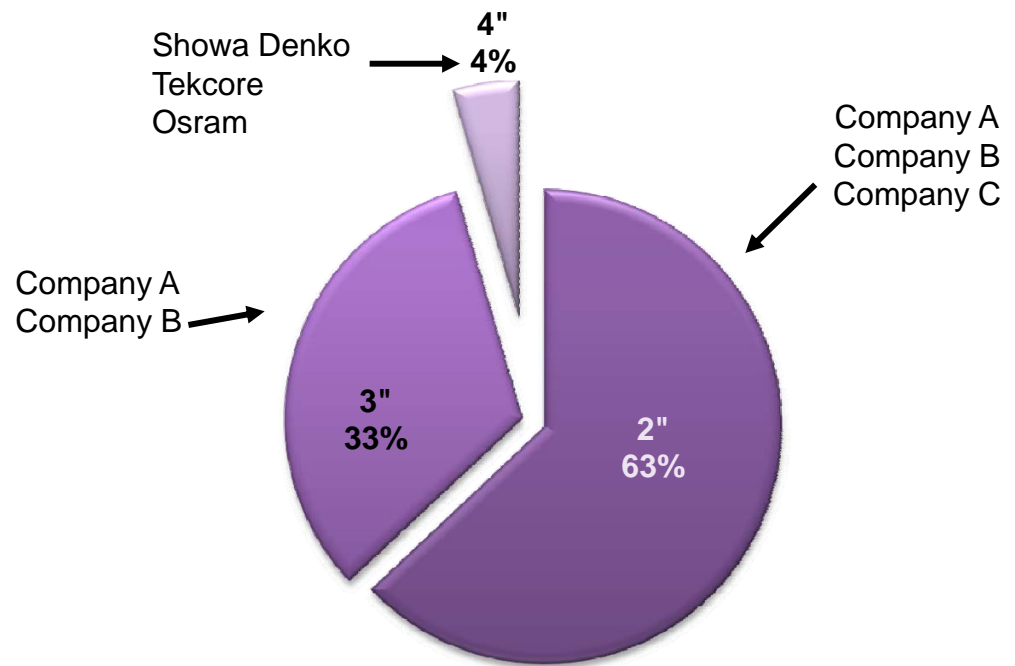


- **2007 Average Selling Price (ASP):**

- **2":**
 - \$19-\$25 (Korea, Taiwan or China)
 - \$XX-\$XX (Europe, US)
- **3":** ~\$XXX
- **4":** ~\$XXX



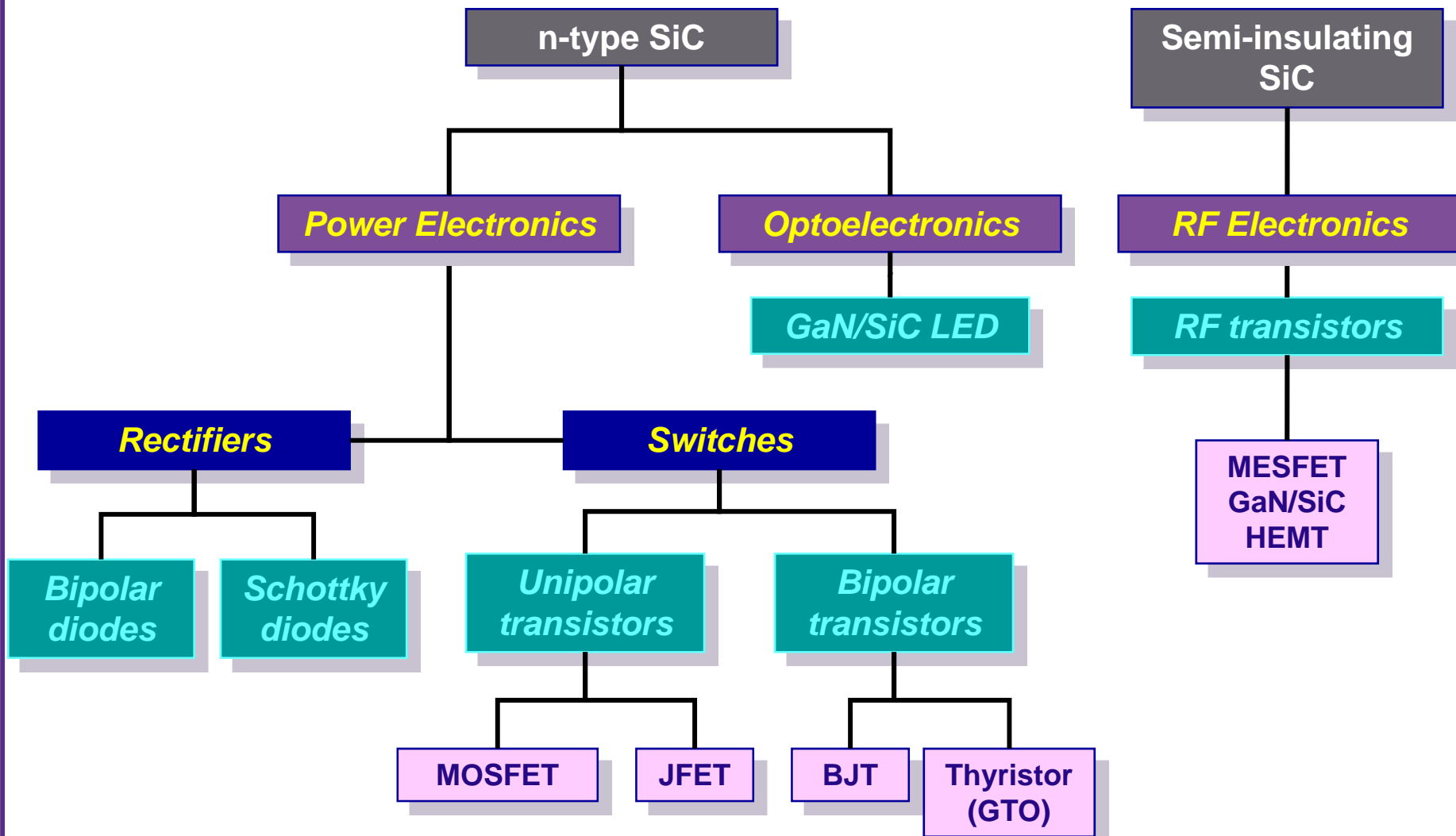
2007 sapphire substrates market in Msi processed.
Breakdown by diameter



Breakdown over a 2007 total of 14.5 Msi processed

Sources: Yole Développement

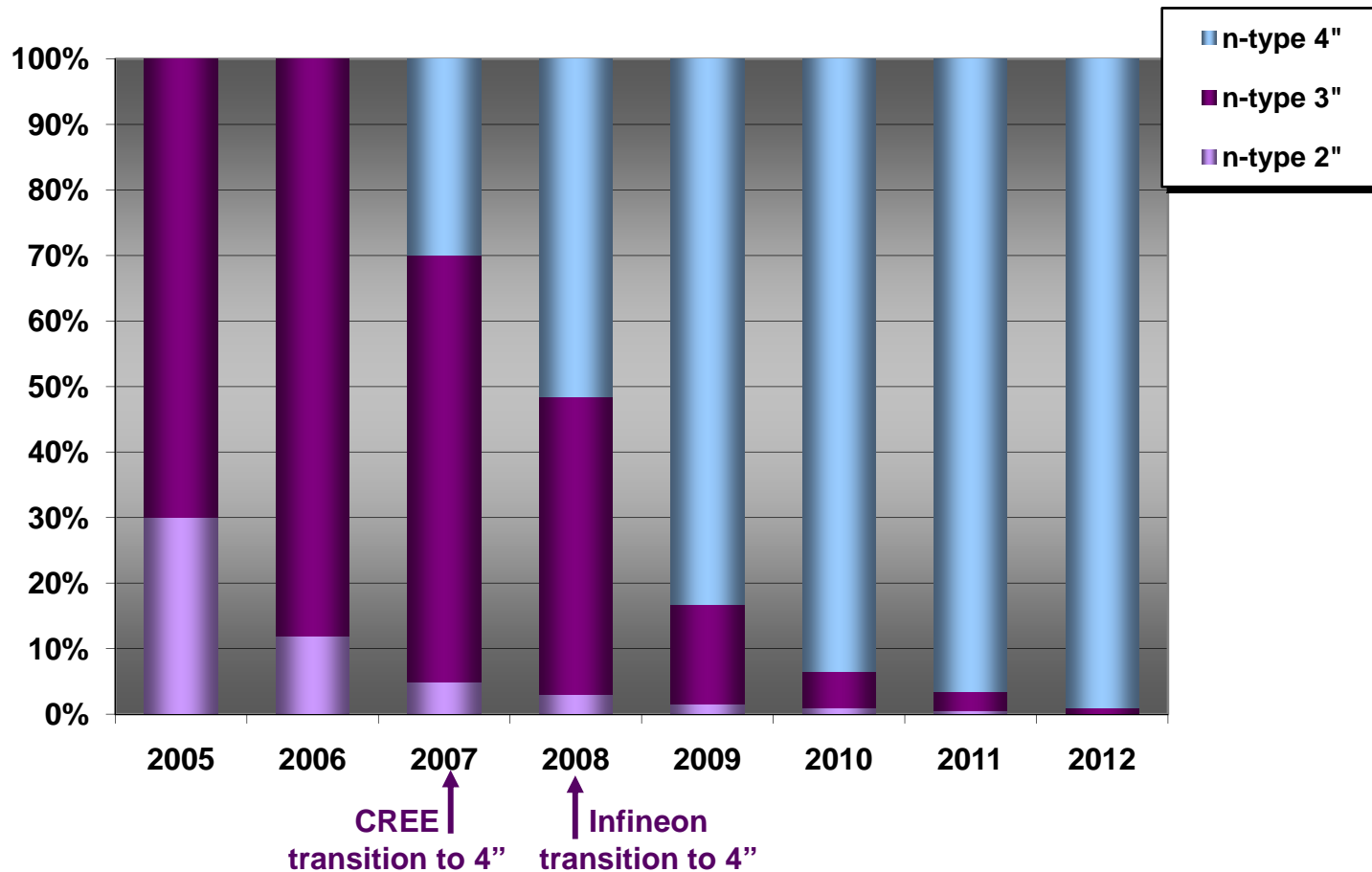
SiC material type vs. applications



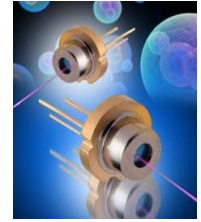
Wafers diameter evolution in production for Power Electronics



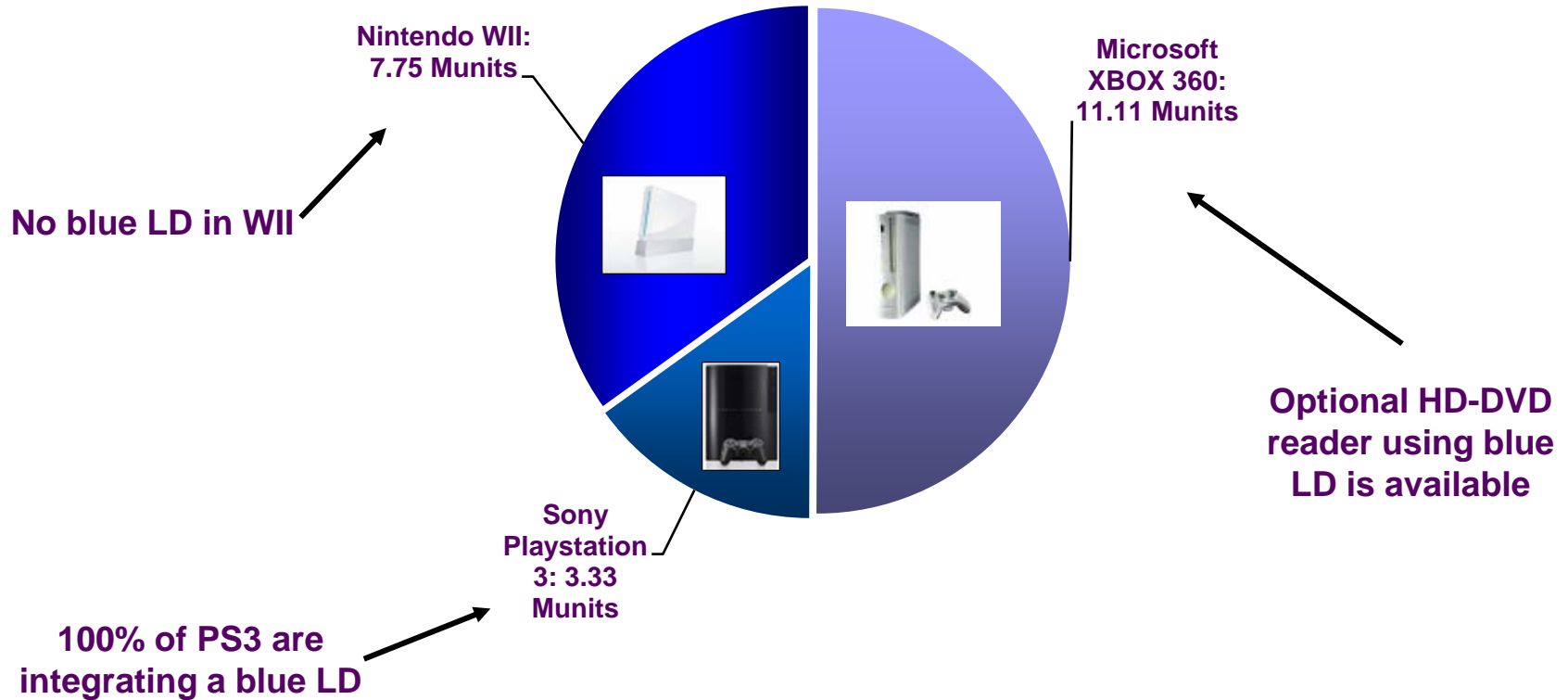
2005-2012 SiC substrates diameter evolution for power electronics
(in % of processed surface)



Blue laser diodes market in game stations



Cumulative sales of new generation game stations as of June 07



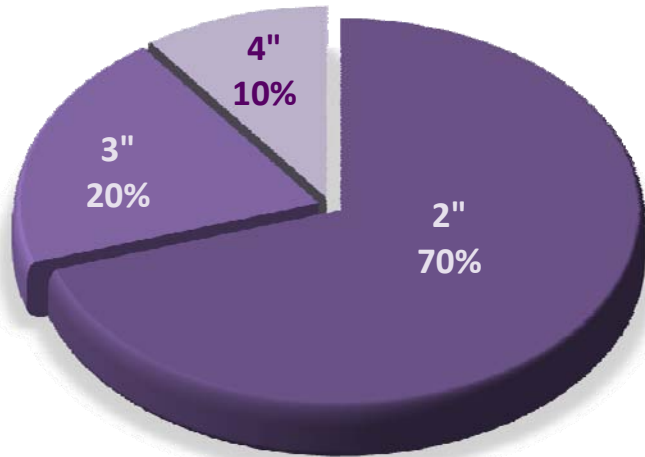
Usage of InP wafers and Substrates diameter breakdown



	InP wafers for Opto Devices	InP wafers for Electron Devices
In value	70 %	30 %
In volume	90 %	10 %

Electron devices are mainly using 4" wafers unlike Opto world that uses cheaper 2" substrates

InP substrate market size split by diameter



2" substrates are leading the market in 2007 with:

- 2": ~ XX,000 units**
- 3": ~ X,000 units**
- 4": ~ X,500 units**

Split over a 2007 overall market of \$XX.XM

2007 market volume was ~ XX,XXX units (2"+3"+4") so about XX,XXX x 2" equiv. wafers