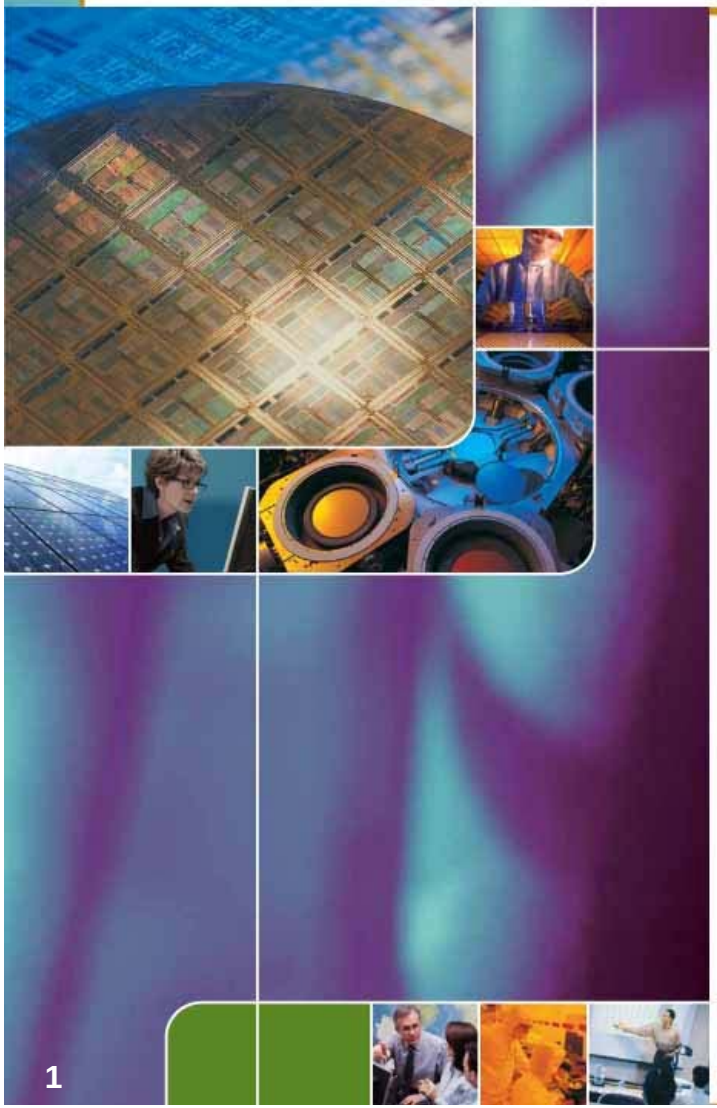
Semiconductor Materials Outlook



Strategic Materials Conference

Dan Tracy
SEMI Industry Research & Statistics Group

January 14, 2010

Outline

Update on current market and forecast for,

- ✓ **Fab Materials**
- ✓ **Packaging Materials**

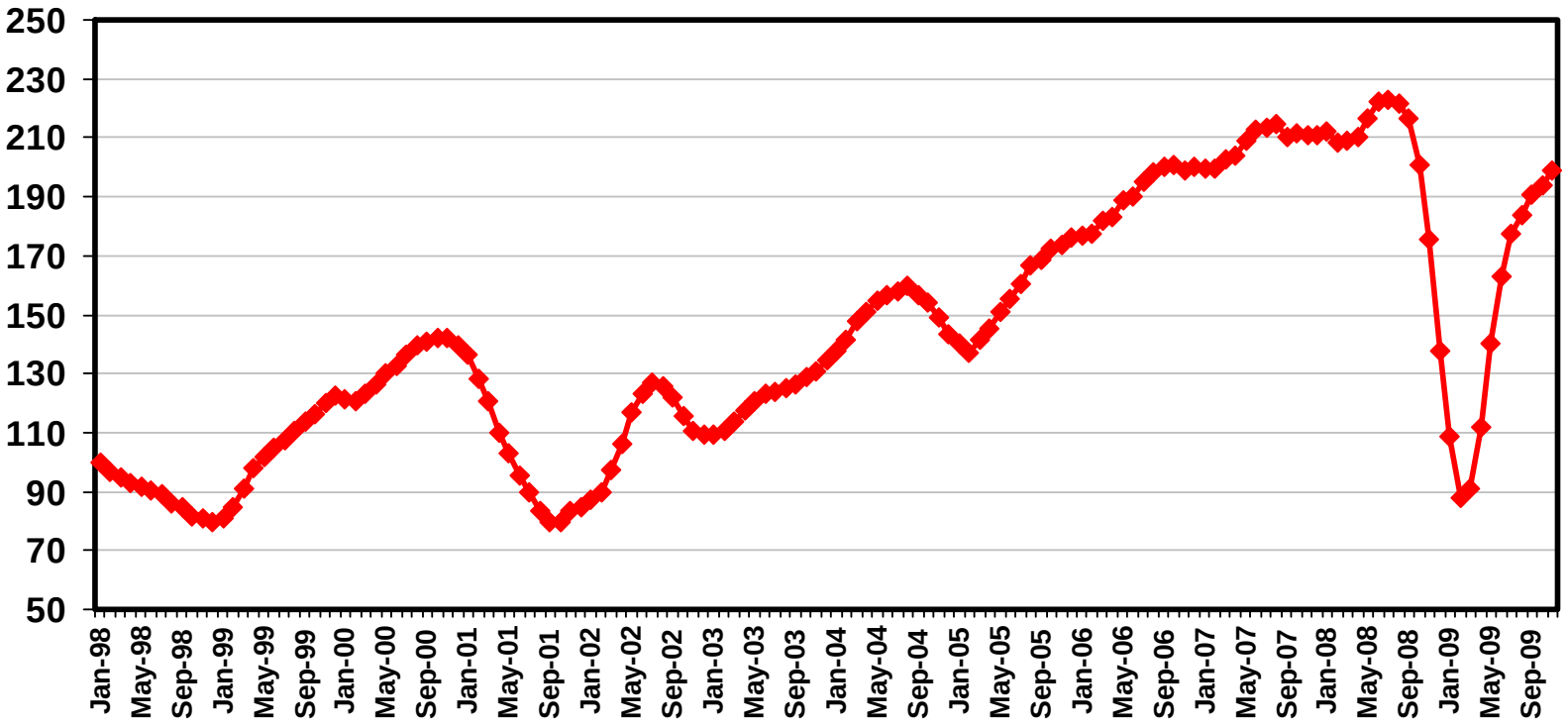
Summary

Fab Materials

Silicon Area Shipment Index

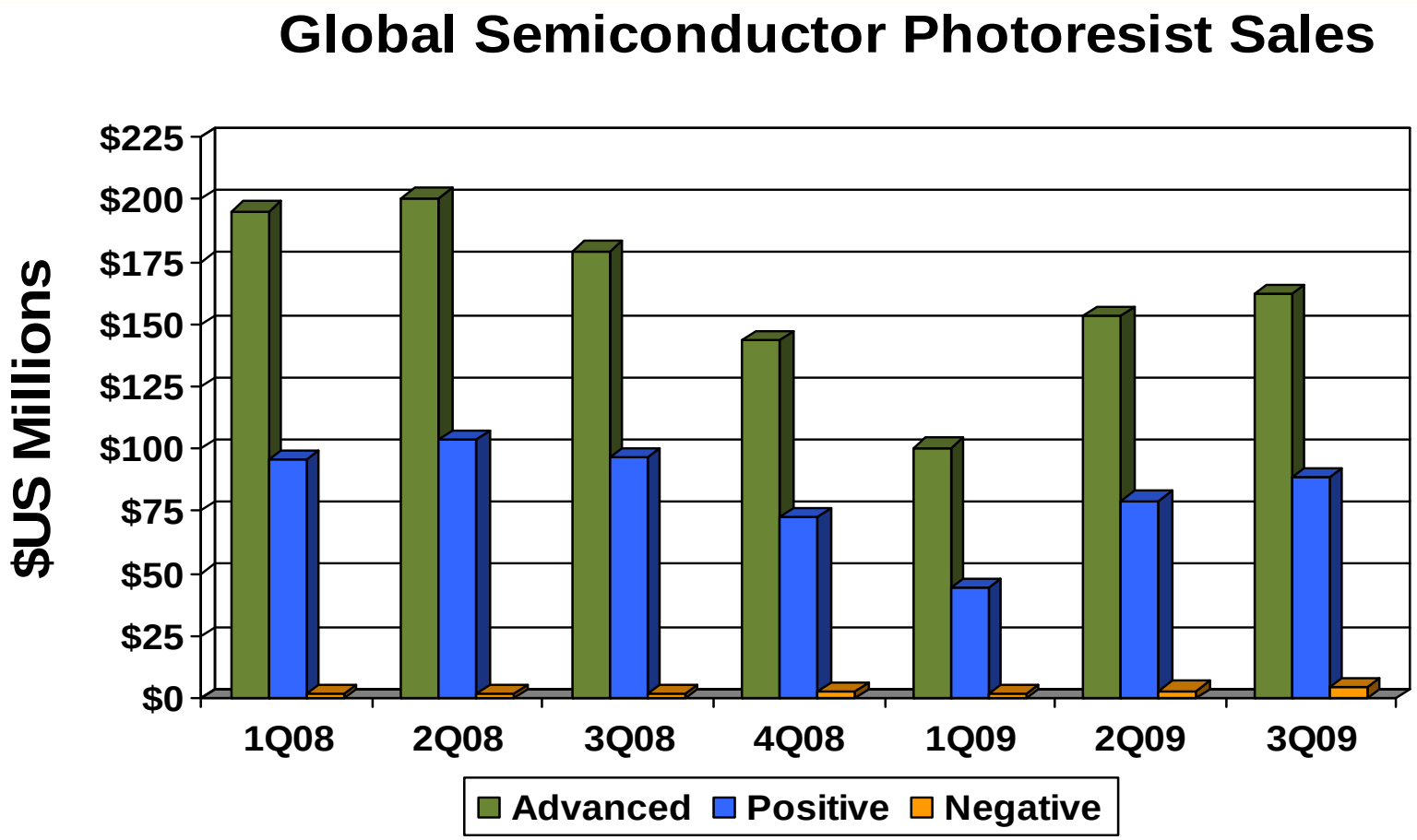
Worldwide Wafer Area Shipment Index

(Three-month moving average)



Source: SEMI Silicon Manufacturers Group December 2009

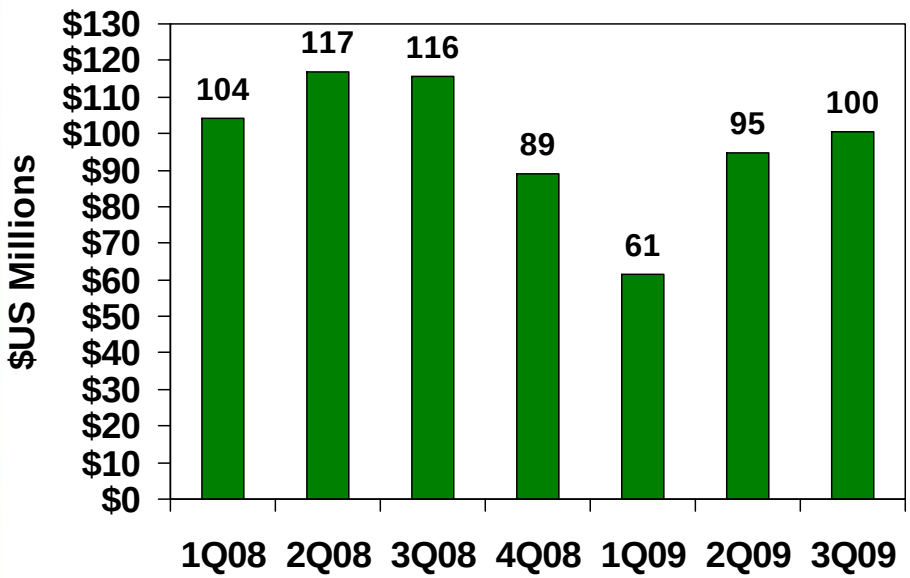
Photoresist Market Quarterly Sales



Source: SEMI CGMG November 2009

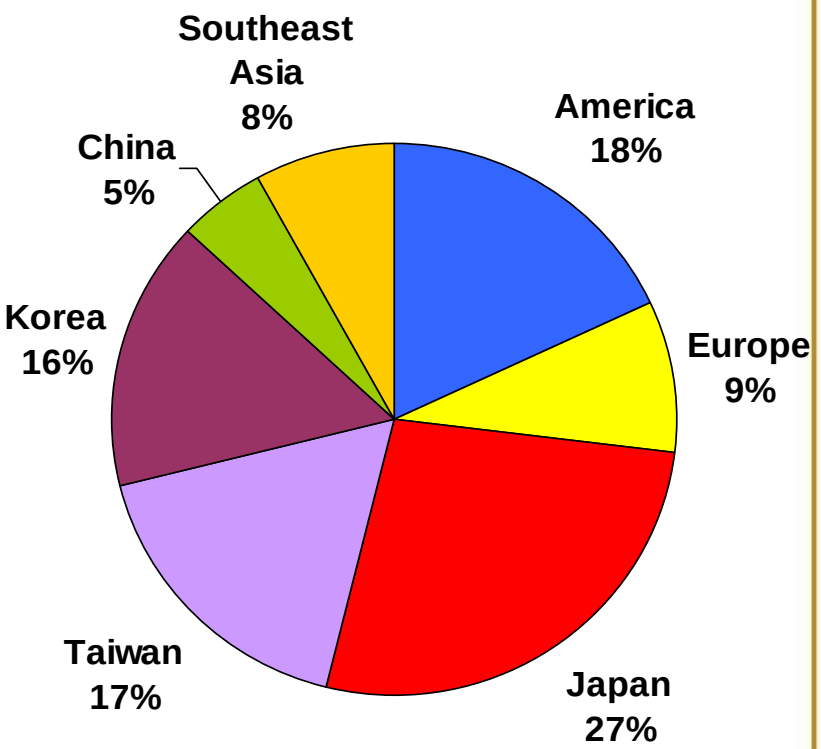
Ancillary Chemicals Market (includes developers, removal chemicals, anti-reflective coatings, and other)

Global Anti-Reflective Coatings Market



Source: SEMI CGMG November 2009

Total Ancillary Chemicals



*Total may differ slightly due to rounding

2009F = $1,144M

Worldwide Wafer Fab Materials Forecast

US$ Millions	Actual	Actual	Forecast		
	2007	2008	2009	2010	2011
Silicon Wafers[1]	12,830	11,924	7,229	9,010	10,052
Photomasks[2]	2,975	2,900	2,491	2,590	2,846
Photoresists	1,144	1,116	926	1,091	1,198
Photoresist Ancillaries[3]	1,219	1,225	1,144	1,350	1,483
Wet Chemicals[4]	904	923	905	941	983
Gases	3,229	3,100	2,515	2,965	3,257
Sputter Targets[4]	480	508	356	391	438
CMP Slurry & Pads[5]	1,024	1,007	897	1,092	1,218
Other/New Materials[6]	1,271	1,439	1,359	1,575	1,757
Total	**$25,076**	**$24,143**	**$17,822**	**$21,005**	**$23,232**
% Growth		**-3.7%**	**-26.2%**	**17.9%**	**10.6%**

Totals may not add due to rounding

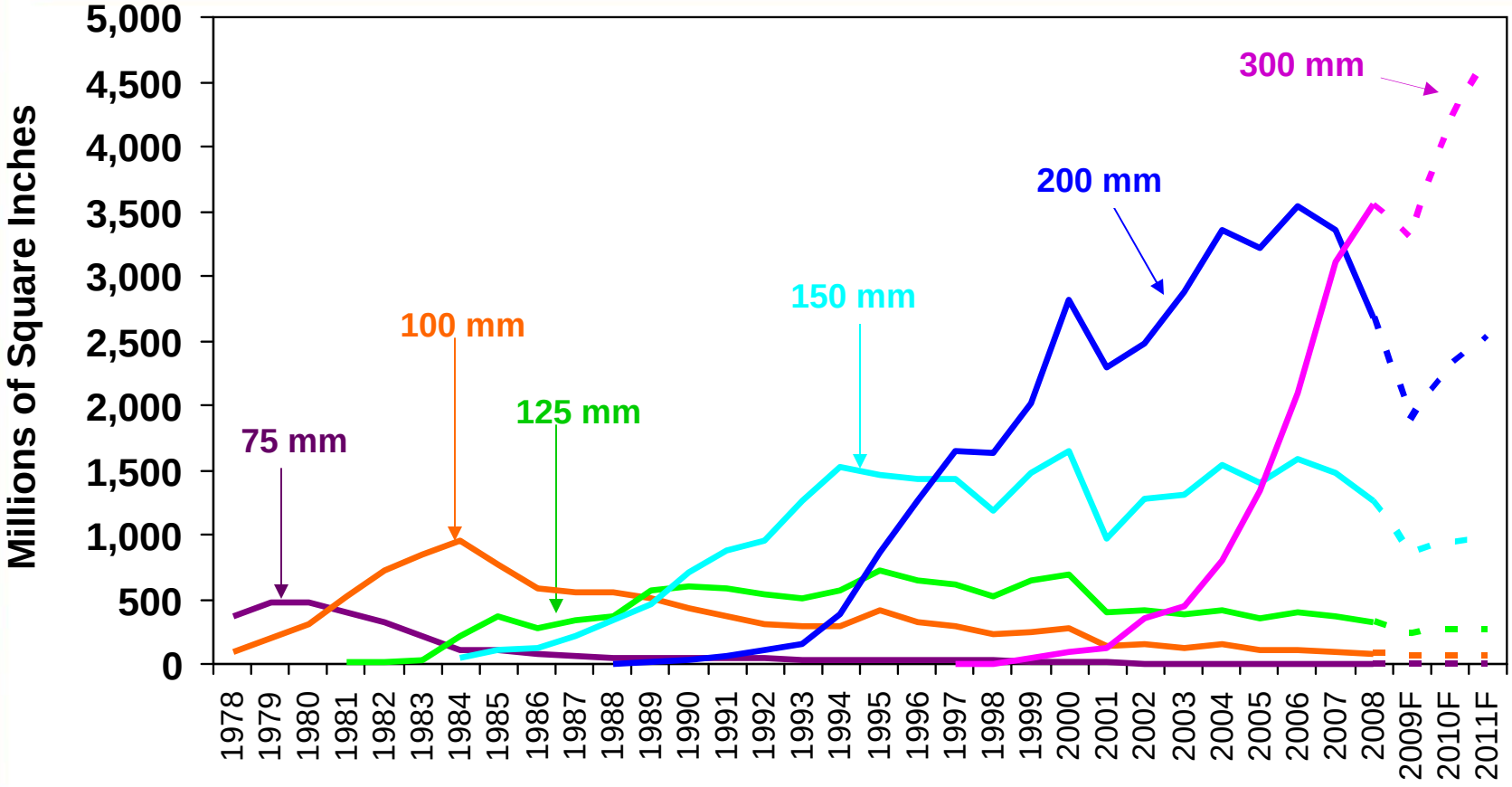
Source: SEMI January 2010

Wafer Fab Materials Forecast Notes

1. Silicon wafers include merchant sales value only; includes SOI wafers; no reclaim wafers
2. Includes captive market
3. Includes resist removal chemicals, developers, anti-reflective coatings, contrast enhancers, edge bead removers, adhesion promoters, etc.
4. Source is Techcet Group LLC, includes precious metals
5. Estimates for IC applications only
6. Includes low k dielectrics, copper plating solutions, dielectric precursors, organometallic precursors, etc.
7. All forecasts in current dollars
8. Source for all data is SEMI, unless otherwise indicated

Source: SEMI January 2010

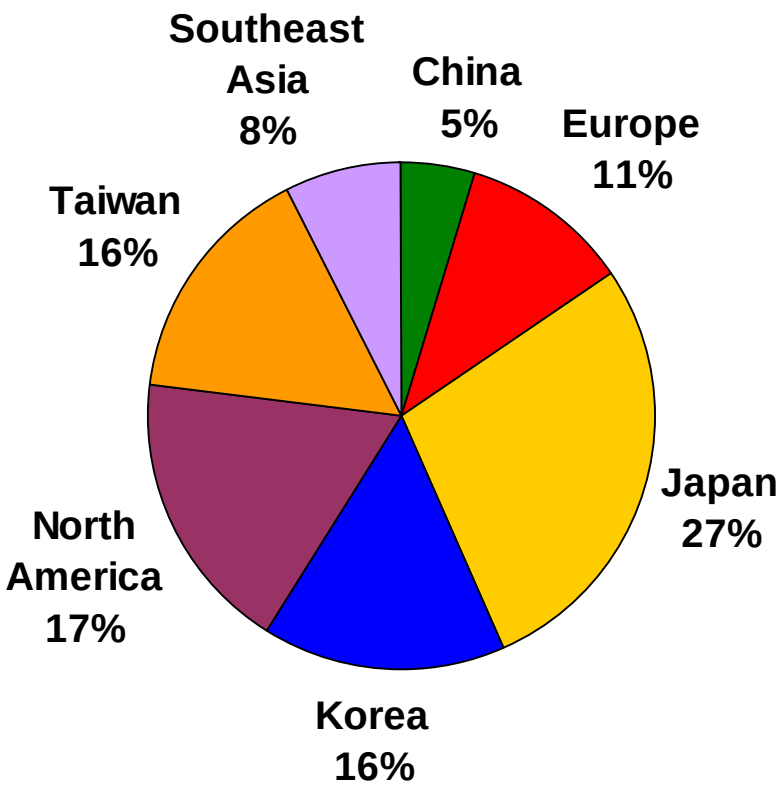
Global Silicon Wafer Outlook by Diameter



Includes polished and epi wafers. Excludes reclaim, non polished, and SOI.

Source: Rose Associates 1978 to 1995; SEMI SMG 1995 to 2008; SEMI Forecast

Regional Fab Materials Markets



2009 = $17.8 Billion

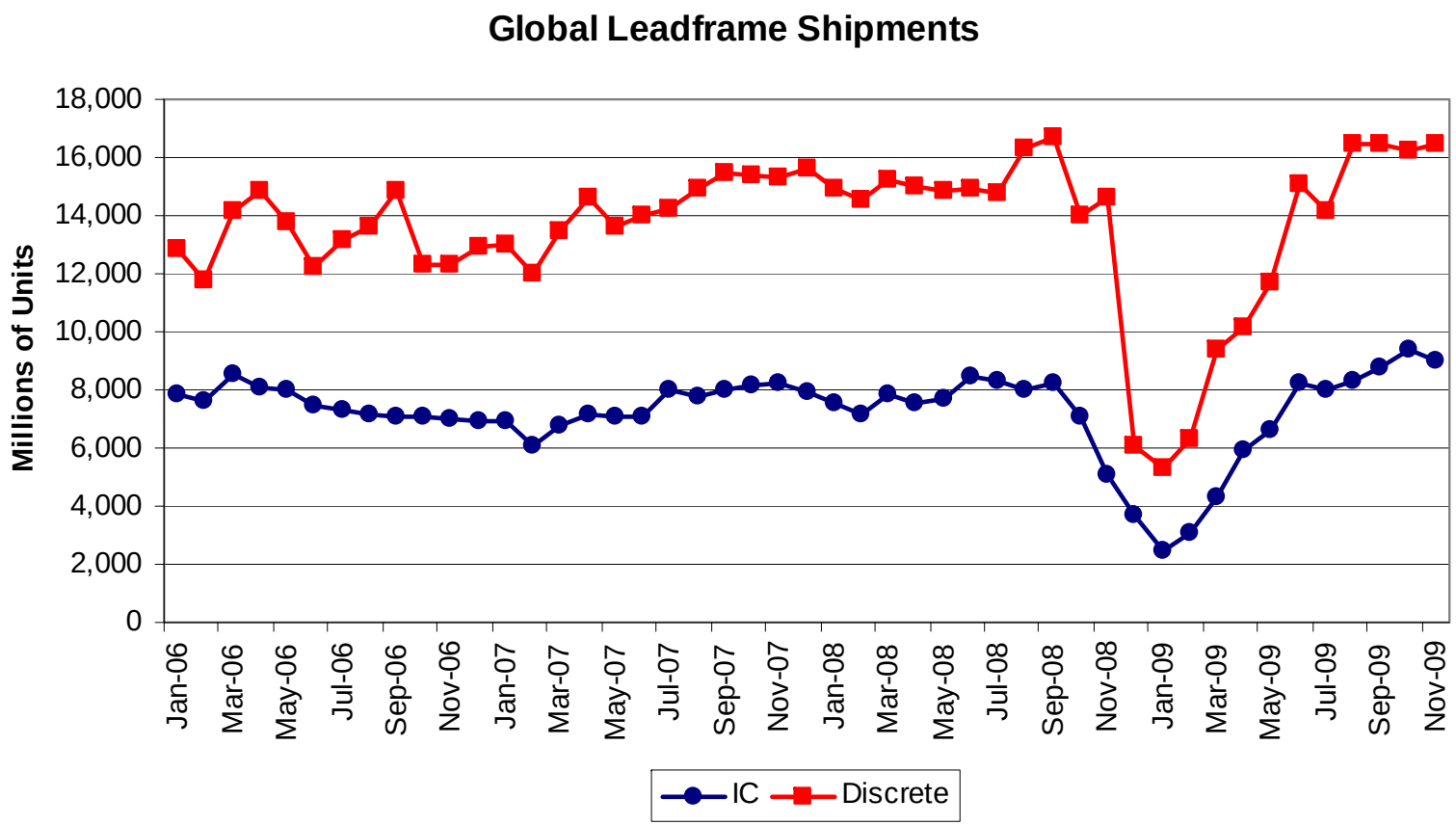
Region	2009F $B	2010F $B	% Change
China	0.84	0.96	14%
Europe	1.93	2.27	18%
Japan	4.97	5.85	18%
Korea	2.77	3.27	18%
North America	3.20	3.76	18%
Taiwan	2.78	3.34	20%
Southeast Asia	1.34	1.56	16%
Total Regions	17.83	21.01	18%

Source: SEMI January 2010

Totals may not add due to rounding

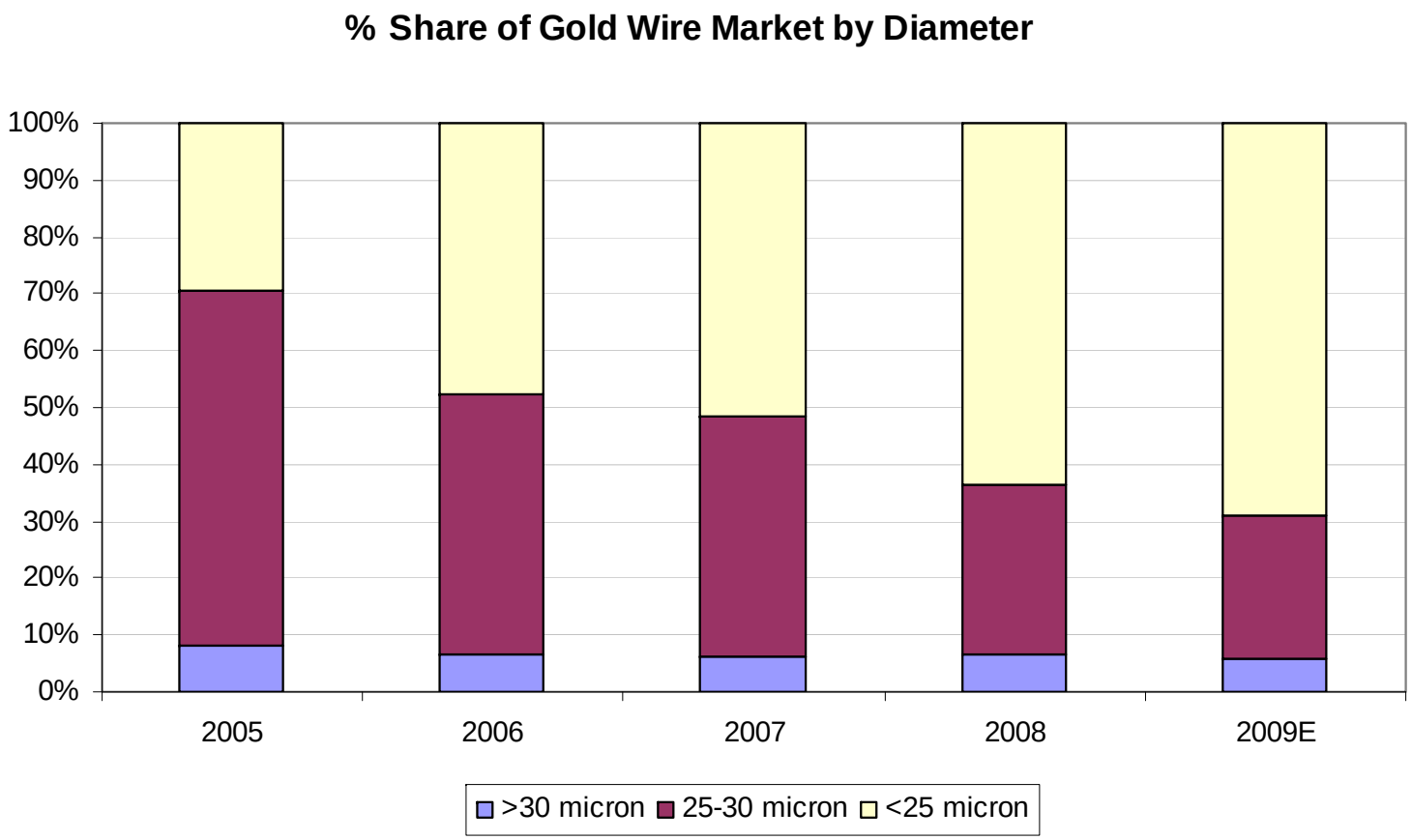
Packaging Materials

Leadframes-
Shipments return to year ago levels



Source: SEMI December 2009

Gold Bonding Wire: Transition to Smaller Diameters



Source: SEMI and TechSearch International, Global Semiconductor Packaging Materials Outlook

Worldwide Semiconductor Packaging Materials Forecasts

US$ Millions	Actual		Forecast		
	2007	2008	2009	2010	2011
Leadframes	$3,289	$3,013	$2,586	$2,908	$2,976
Organic Substrates[1]	6,656	7,586	6,967	7,674	8,255
Ceramic Packages	1,574	1,501	1,290	1,388	1,429
Encapsulation Resins	1,624	1,475	1,284	1,464	1,559
Bonding Wire[3]	3,592	3,968	3,838	4,359	4,446
Die Attach Materials[4]	612	588	582	650	682
Others[5]	242	193	179	207	233
Total	**$17,589**	**$18,324**	**$16,726**	**$18,650**	**$19,580**
% Growth		**4.2%**	**-8.7%**	**11.5%**	**5.0%**

Source: SEMI November 2009

Semiconductor Packaging Materials Forecast Notes

1. Source is TechSearch International. Includes PBGA, PPGA, LGA, and CSP laminate substrates and flex BGA and CSP substrates
2. Assume gold value of $660/trz for 2007, $872/trz for 2008, $920 for 2009-2011 forecast period
3. Includes die attach film (tape) materials
4. Other includes solder balls and wafer level package dielectrics
5. Source for all data is SEMI, unless otherwise indicated
6. All forecasts in current dollars

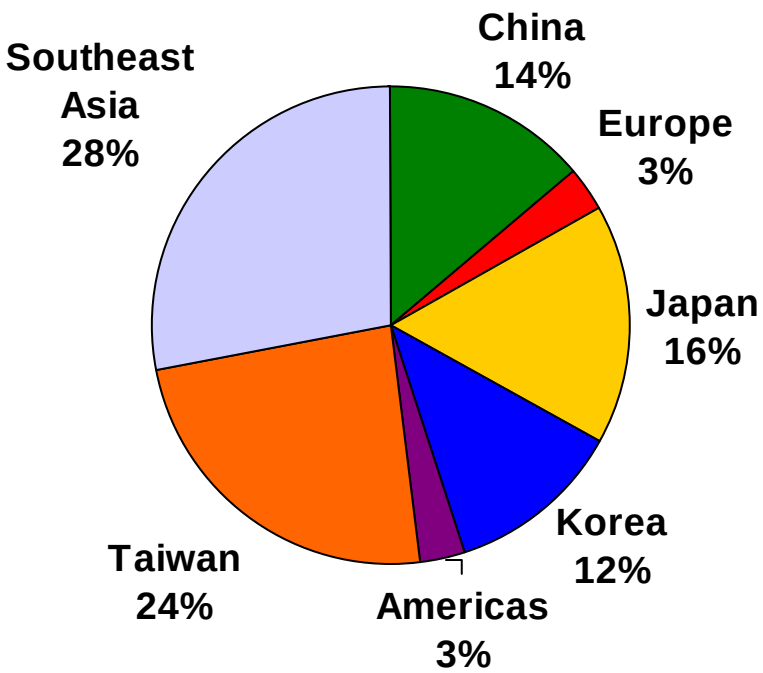
Source: SEMI November 2009

Packaging Materials Unit Outlook

Segment	2008	2009F	2010F	2011F
Organic Substrates (K square meters)	7,574	6,573	7,055	7,479
Leadframes (billions of units)	331	300	343	365
Bonding Wire (billions of meters)	15.8	15.4	18.0	20.3
Mold Compound (millions of kg)	158.0	137.4	160.7	171.3

Source: SEMI and TechSearch International, Global Semiconductor Packaging Materials Outlook

Regional Semiconductor Packaging Materials Markets



2009 = $16.7 Billion

Region	2009F $B	2010F $B	% Change
China	2.42	2.84	17%
Europe	0.55	0.59	7%
Japan	2.71	2.84	5%
Korea	1.95	2.17	11%
Americas	0.48	0.52	8%
Taiwan	3.97	4.51	14%
Southeast Asia	4.65	5.18	11%
Total Regions	16.73	18.65	11%

Totals may not add due to rounding

Source: SEMI November 2009

China Semiconductor Packaging Market

Trends in China:

✓ **Packaging houses**

- More than 15 companies are capable of substrate-based packaging technology
- Seven bumping fabs with wafer size arranged from 125mm to 300mm
- TSV for CIS is under mass production

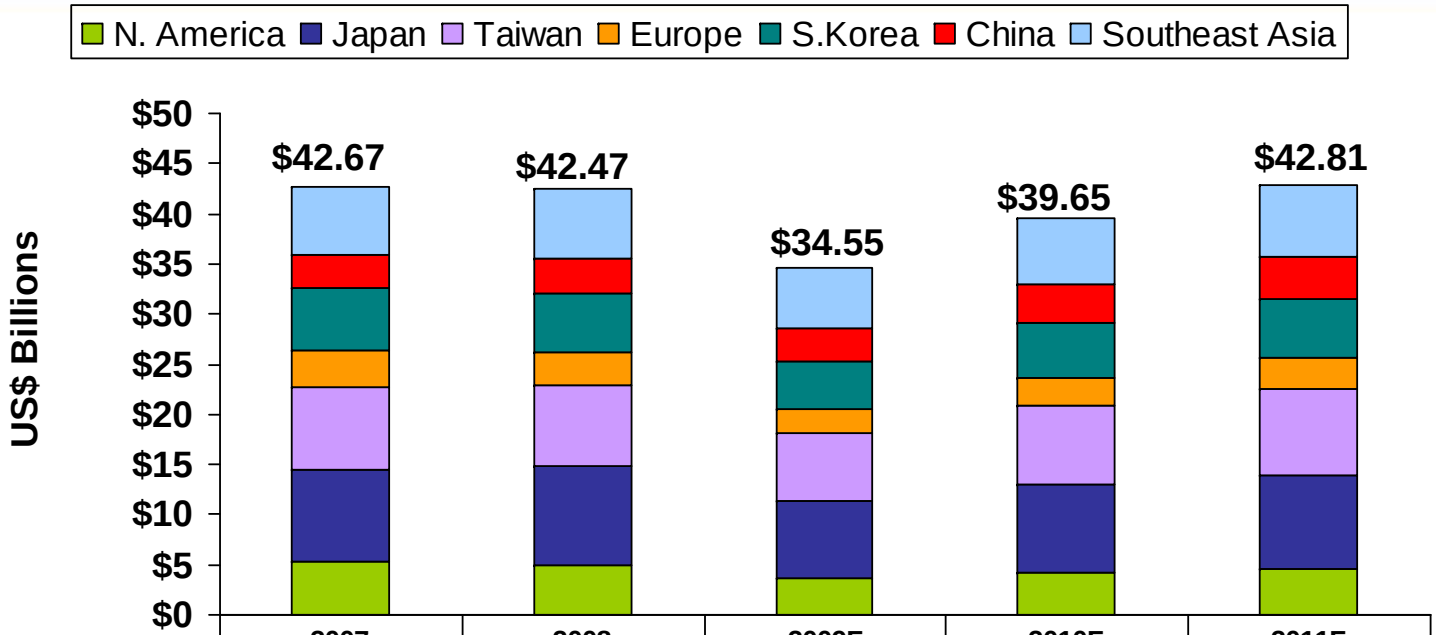
✓ **Packaging Materials**

- China is estimated to represent about 15% of the packaging materials market in 2010
- Substrate drives the growth of packaging material market in the next several years
- China headquartered packaging material suppliers have made progress in developing and manufacturing leadframes, bonding wires, mold compounds, solder balls, and plating chemicals

Source: SEMI *China Semiconductor Packaging Market Overview* (new report to be issued)

Summary

SEMI® 2009 Materials Forecast By Market Region



	2007	2008	2009F	2010F	2011F
Southeast Asia	6.79	6.90	5.99	6.74	7.12
China	3.31	3.57	3.26	3.80	4.16
S.Korea	6.10	5.90	4.71	5.44	5.92
Europe	3.68	3.29	2.47	2.86	3.08
Taiwan	8.34	7.90	6.76	7.85	8.55
Japan	9.19	9.98	7.67	8.69	9.34
N. America	5.25	4.93	3.68	4.27	4.63

Totals may not add due to rounding.

Source: SEMI January 2010

Summary

- **Semiconductor Materials Market**
  - 2009 forecasted to decline -19% overall
    - -26% decline in Fab Material spending
    - -9% decline in Packaging Material spending
  - 2010 outlook to be inline with overall semiconductor market growth
    - +18% increase in Fab Material spending
    - +11% increase in Packaging Material spending