

RSC | Advancing the
Chemical Sciences

Maintaining Growth via Product Development

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Epichem Group

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HIGH PURITY CHEMICALS

FOR THE ELECTRONIC INDUSTRY

INITIAL PRODUCT

1983 Silane – Existing identifiable market

Replacing Imports

Export Potential

Funds from BTG, Barclays, DTI

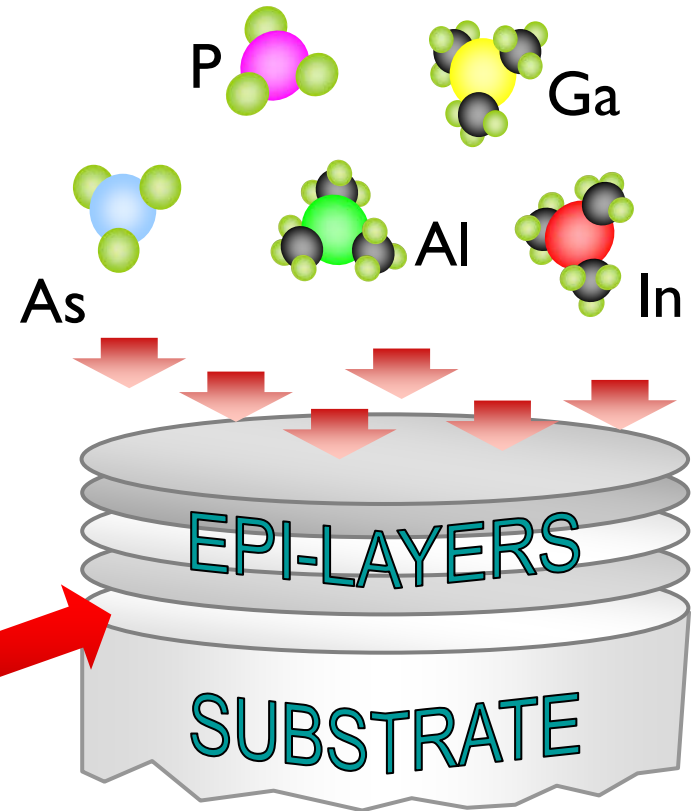
1st Innovation – Trimethyl Gallium

- Required by MOD to produce intensifiers Ga Al As photo cathodes for image intensifiers
- MOD funded work at Liverpool under Professor David Cole Hamilton and Dr Tony Jones
- Never included in Business Plan
- Very demanding purity requirements ppb levels
- Required unique purification and analytical techniques
- Pyrophoric liquid

1985 - 1995 *Wide range of organometallics*

- Soon became obvious the same issues applied to TMI, TEG, DMZ, DEZ, Cp₂Mg, etc.
- Only way to develop products was with close collaboration with end users and key academic centres of excellence.
- Applications rolled out for Compound Semiconductor
 - Visible lasers, HBLEDs, Solar Cells.

MOVPE PROCESS



Applications of Compound Semiconductors

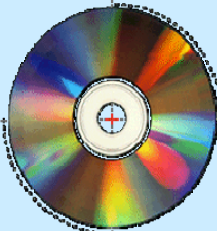
Communications

Fibre
-Optic

Mobile /
Wireless



Data
Storage



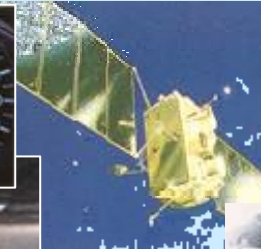
Lighting
&
Display



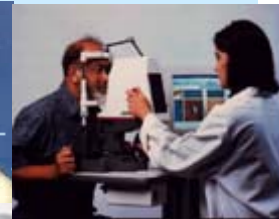
Auto-
motive



Satellite



Medical



1993 – BCl_3

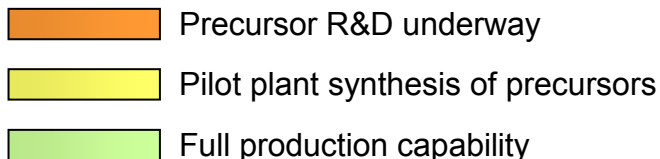
- Similar to silane
- Replace imports
- Great export potential
- Unique process giving very high purity material

2000 Purchase of Inorgtech

- New materials required to continue Moores Law.
- Long time generation for R&D to reach sales
- First really new material used in recently announced Penryn Processor.

Epichem Precursor Roadmap

	2006	2007	2008	2009	2010	2011
Dielectric Layers (Logic/Memory)						
Current ALD for DRAM (Al ₂ O ₃ , Ta ₂ O ₅)	Full production capability					
Hf/Zr Based High-k (Si, N, Al, La, Y..... additions)	Pilot plant synthesis of precursors	Full production capability				
High-k or Rare Earth (La ₂ O ₃ , Pr ₂ O ₃ , Y ₂ O ₃silicates)	Precursor R&D underway			Pilot plant synthesis of precursors	Full production capability	
Complex Oxides (LaAlO ₃ , SrTiO ₃ , SrBi ₂ Ta ₂ O ₉)	Precursor R&D underway				Pilot plant synthesis of precursors	Full production capability
Non-Volatile Memory						
FeRAM (Pb(Zr,Ti)O ₃ , SrBi ₂ Ta ₂ O ₉)	Precursor R&D underway		Pilot plant synthesis of precursors	Full production capability		
Phase Change Memory (Ge ₂ Sb ₂ Te ₅)	Precursor R&D underway		Pilot plant synthesis of precursors	Full production capability		
Electrodes						
DRAM or Gate Stack (Ta, Ru, Ta _x Si _y N _z , Pt, Ni, IrO ₂ , Ti...)	Precursor R&D underway		Pilot plant synthesis of precursors	Full production capability		
Barrier Layers (CVD/ALD)						
Barrier Layers for Tungsten (Ti, TiN)	Precursor R&D underway	Pilot plant synthesis of precursors	Full production capability			
Barrier Layers for Copper (Ta, TaN, WNC, silicon nitrides..)	Precursor R&D underway	Pilot plant synthesis of precursors	Full production capability			
Wiring						
CVD and High A/R ALD Precursors (W, Al, Cu...)	Precursor R&D underway		Pilot plant synthesis of precursors	Full production capability		



Sales Forecasts

Silane Sales	1984 →	1987 →	2006
	£0.25m	£1.3m	£2m

OM Sales	1986 →	2002
	£0.05m	£22m

BCl ₃ Sales	1993 →	2006
	£0	£2m

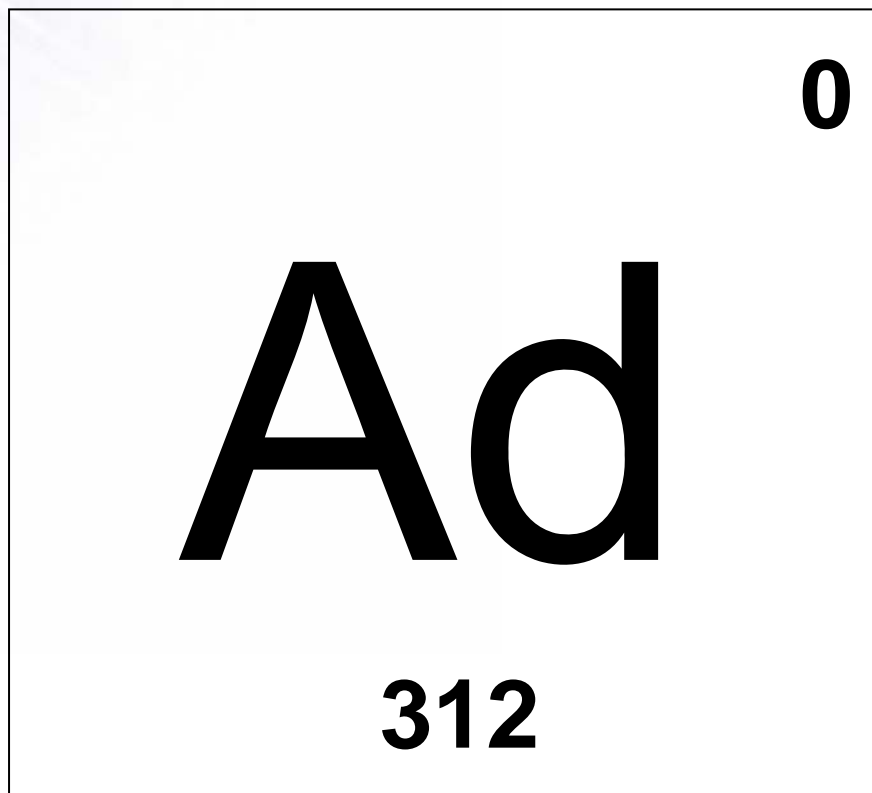
O/Ns	2000 →	2009
	£1m	£15m

Need to have a pipeline of new products!

Epichem acquired by Sigma Aldrich

9th February 2007

- Sigma-Aldrich Corporation has purchased 100% of Epichem.
- Why was Epichem sold to Sigma-Aldrich?
 - Epichem is to become the core of SAFC Hitech business
 - SAFC Hitech intends to build upon our foundation
- Why Sigma-Aldrich/SAFC Hitech?
 - Business logic – a great combination
 - Epichem's R&D, application knowledge and relationships with end user customers in both C/S & Si markets
 - SAFC's world-class manufacturing capacity and resources
- The timing is right! The semiconductor industry faces material needs and changes never before seen in their history. The combined Epichem/SAFC Hitech will be the industry leader in providing enabling technologies.



Administratium