



Science For A Better Life

MaterialScience

Bayer R&D Investor Day 2005

December 8, 2005 | London



Bayer MaterialScience



Bayer R&D Investor Day 2005

Innovation in Electro/Electronics

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Forward Looking Statements



This presentation contains forward-looking statements based on current assumptions and forecasts made by Bayer Group management.

Various known and unknown risks, uncertainties and other factors could lead to material differences between the actual future results, financial situation, development or performance of the company and the estimates given here. These factors include those discussed in our public reports filed with the Frankfurt Stock Exchange and with the U.S. Securities and Exchange Commission (including our Form 20-F). The company assumes no liability whatsoever to update these forward-looking statements or to conform them to future events or developments.

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Key Messages



- **Optical Data Storage** –
State-of-the-art life-cycle management for polycarbonate
- **Bayblend** –
Tailoring properties of high-performance polymers
- **Baytron** –
Competence in new fields of polymer electronics

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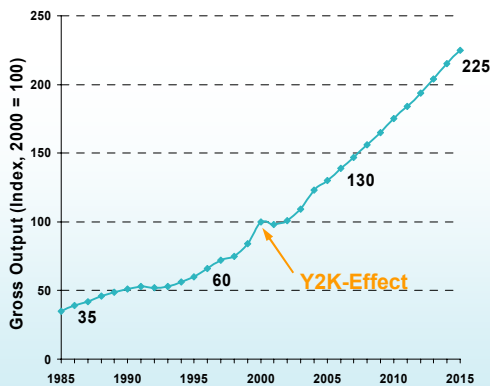
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The Global Electro/Electronics Market

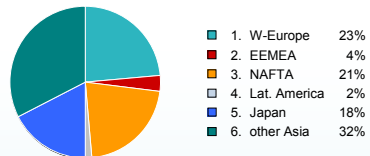
Attractive Long-term Growth Driven by Asia



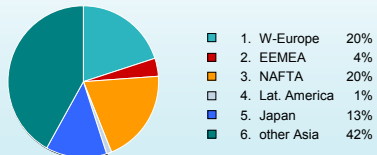
Growth: 6-7% CAGR (1985-2015e)



2005e ~ €1,650 bn



2015e ~ €3,000 bn



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Source: Global Insight – World Industry Monitor (Sept. 2005)

A Key Market for Bayer MaterialScience

Contribution of >€1.4bn Sales in 2005e



2005e Bayer MaterialScience sales by industry

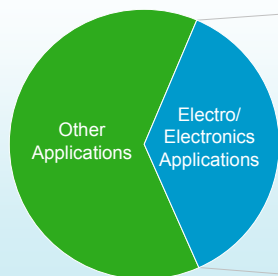
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ODS – Important Stake in Polycarbonate

Polycarbonate is Key to Innovation



Polycarbonate sales
€ 2,035 m (2004)



Optical Data
Storage (ODS)

Other Applications
(Blends, Injection, Film etc.)
including Bayblend

- Polycarbonate sales share in Electro/Electronics approx 50%, ahead of HC Starck and Polyurethanes
- ODS share approx. 20% of total Polycarbonate 2005e sales

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Optical Disc Technology Dominant

Summary of Key Advantages



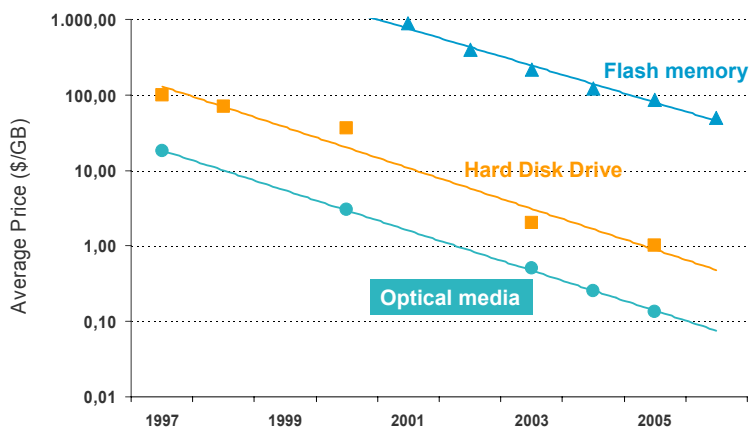
- Ease of use – removable, no cartridge
- Non-contact & easy access
- Performance – high density, high data transfer rates
- Durability – handling resistance, reliability ensured by cover layer
- Archivability – life time expectation
- Multi-function media formats – ROM, -R, -RW
- Compatibility – backward and horizontal within optical media
- Bit cost efficiency (established polymer and molding technologies)

Optical discs – Leading in data storage technology

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Optical Media Unmatched on Price

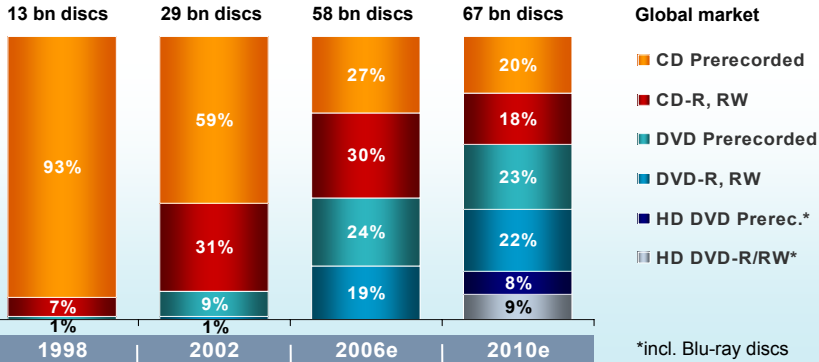
Comparison of Bit Cost Efficiency



Optical media are unmatched in cost-efficient data storage

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Shift Towards New Formats in Short Cycles Polycarbonate At The Spearhead of Innovation



- Shift towards recordable media: opportunity for new market segments
- Blue laser formats are ready for mass commercialization in 2006
- Underlying demand for data storage fuels growth in foreseeable future

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Polycarbonate – Resin of Choice in ODS Matching Present and Future Requirements



- Balanced property profile at economic cost
- Outstanding transparency assuring excellent transmission of laser beam
- Impact resistance, stiffness, high heat deflection temperature and low water absorption
- Accurate pit replication through extremely high resin flowability
- Favorable heat transfer coefficient – reduced overall cycle times through shortened cooling times
- Globally established supply chain

Material of choice for next generations of optical data storage

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Polycarbonate Life-Cycle Management

Providing Solutions for New Market Trends



Requirements

Optical properties

- High transmission
- High purity
- Low birefringence

Processing

- Short cycle time
- High flowability
- High toughness
- High dimensional stability

Surface properties

- Excellent nano-scale replication
- "Perfect" surface quality
- High metal adhesion

CD

DVD

Blu-ray
HD-DVD

Near
Field

Main product generations

1983	Makrolon KL 1-1158
1989	Makrolon DP 1-1218
1990	Makrolon CD 2000
1991	Makrolon CD 2005
1996	Makrolon DP1-1265
2005	Makrolon OD 2015
20XX	Next-Generation-Makrolon

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Roadmap to Future Optical Disc Formats

Polycarbonate Accompanies Innovation



	1st generation CD	2nd generation DVD	3rd generation HD-DVD Blu-ray		4th generation Near Field Recording	New technologies Holography
Capacity/layer (GB)	0.65	4.7	20	25	> 100	200-1600
Wave length (nm)	780	650	405	405	405	650 / 405
Optical path (mm)	1.2	0.6	0.6	0.1	0.02 μm	3D(0.6-2.4)
	Current formats				Future formats	

Only continuous material improvements allow new generations and formats, through improved surface quality, dimensional stability, rigidity, flowability, etc.

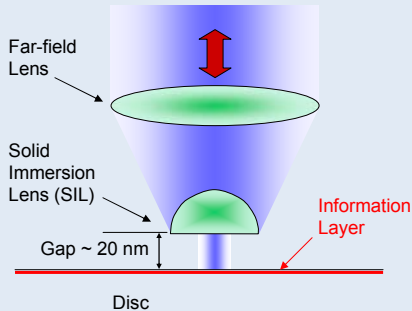
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4th ODS Generation – Near Field Recording

Polycarbonate With 'Perfect' Surface Quality Required



Near Field Recording



- > 100 GB Capacity
- Extremely small working distance (20 nm)
- 'Perfect' surface quality
- Nano-scaled pit structures

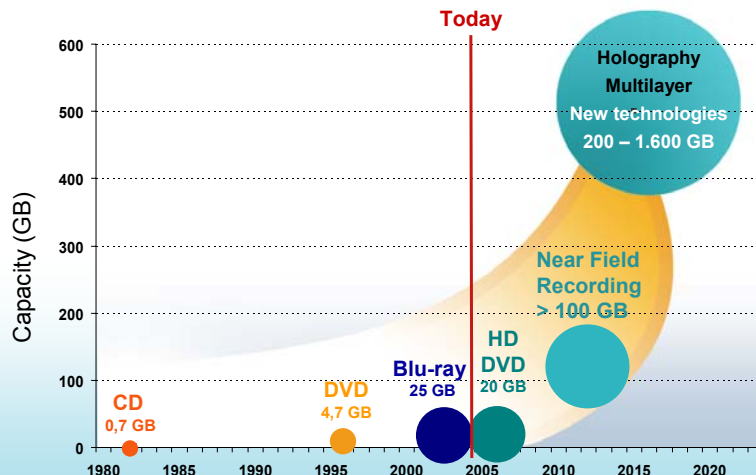
Polycarbonate is resin of choice

- Fulfilling all requirements for Near Field Recording
- Established material that works

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New Dimensions in Data Storage

MaterialScience is Actively Involved



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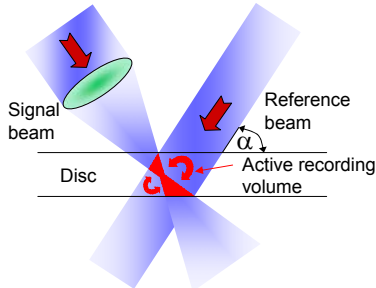
Holographic Data Storage

A Future Technology in ODS



The technology

- 3-Dimensional volumetric data storage
- Signal beam carries data and interferes with reference beam in polymeric storage medium
- Key advantages: high storage density, rapid data transfer, low cost per GB



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Bayer's position

- Joint development agreement with the US company InPhase Technologies Inc.
- Development and supply of polymeric storage materials
- Explore additional market opportunities beyond optical data storage

Bayer and Holographic Data Storage

Positioned In a Network of Strong Partners



Development partners

Drive Mechanics	ALPS
SLM	DisplayTECH
Laser	SONY
Detector	Fillfactory
OMA	Large Optical Company
Media	maxell
Chemicals	Bayer MaterialScience

InPhase

Manufacturing partners

Drive
Numerous suppliers

maxell
Bayer MaterialScience

Media

Customers & Integration partners

OEM
Drives, media, archival solutions



Robotics
Software & solution Integrators

Project targets

- Commercialization of the world's first holographic data storage drive and media
- Initial capacity 300 GB, transfer rate 20 MB/sec
- Potential storage capacity up to 1.6 TB
- All relevant formats, e.g. -ROM, -R and -RW
- Format flexibility – cards, disk, postage stamp, etc.

Source: InPhase Technologies

Strong partnership as a competitive advantage over other initiatives in industry

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The Future of Holographic Technologies

Potential Beyond ODS



Market growth through increased performance

Market growth through new applications



Source: Bundesdruckerei

German passport with holographic shadow pictures (HSP™) made of a photopolymer



Source: ECB

New types of holographic images for advanced banknote and brand security

Source: Siemens VDO



- Holographic mirror for next generation projection displays, e.g. automotive "heads-up"
- Full-color 3-D display and image

2006-2007

2010e

≥ 2015e

- Document security
- 3-D imaging media

- Anti-counterfeiting

- New display technologies



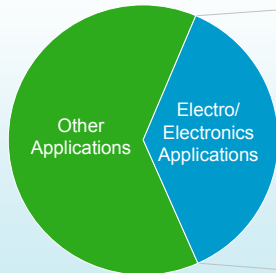
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Bayblend in Electro/Electronics

High Performance Polymer for Multiple Applications



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Optical Data
Storage (ODS)

Other Applications
(Blends, Injection, Film etc.)
including Bayblend

- Bayblend, a Polycarbonate/ABS blend polymer, offering tailored properties for electro/electronics applications

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Bayblend in Housing Applications

Meeting All Crucial Requirements



Challenges for a polymer used in housing applications

- High-heat distortion temperature
- High tensile modulus
- Excellent chemical resistance
- Excellent processability
- Eco-label compliance
- Balance of excellent melt flow and mechanical performance
- Light stability



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Bayblend – Two Polymers in One

Combining Properties of Polycarbonates & ABS



BAYBLEND®

Standard grades

Already providing a high performance profile

- Very good low temperature toughness
- High heat distortion temperature
- Excellent processing behavior
- High dimensional stability

... used in home applications, such as mobile phones, switches, plug connectors, battery power station



FR grades

Adding additional high-tech features

- Excellent flame retardancy (FR): Cl, Br-free
- Excellent mechanical properties
- Improved processability
- Improved hydrolysis resistance

... used in home application, such as business machines requiring eco-label compliance (e.g. monitors, printers, computers, copiers)



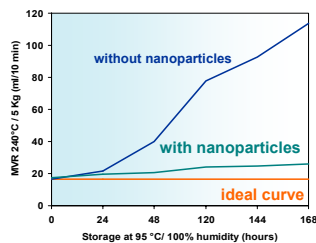
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Bayblend FR Involves Nanoparticles

Improved Hydrolysis Resistance and Flame Retardancy



Practical testing

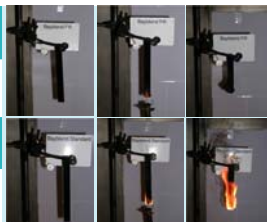


1st and 2nd flame impingement

No afterburning

1st flame impingement

Sample destroyed (after 45 sec.)



- Humidity induces hydrolytic degradation of polymer
- Nanoparticles combines excellent hydrolysis resistance with improved flame retardancy
- Char formation catalyzed by nanoparticles adds to flame retardancy

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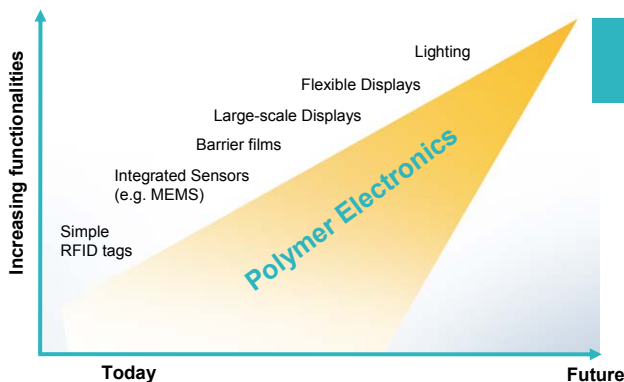
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Future Trends in the Electronic Industry

Functional Polymers Entering the Scene



- Addition of new functionalities (e.g. electroconductivity, luminescence) opens up new opportunities for use of polymers in the electronics industry
- Polymer electronics adds to today's silicon based technologies



Advantages of polymer electronics

- Mass product
- Flexible material
- Cheap, disposable
- Good processability

Multi-functionality as a key factor in polymer electronics

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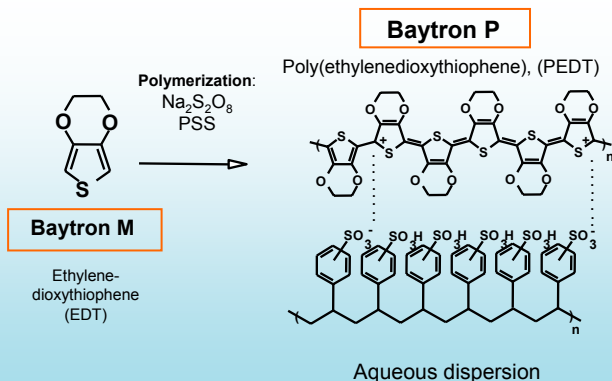
Baytron – A Versatile Conductive Polymer

Making Polymer Electronics Work



What makes Baytron unique?

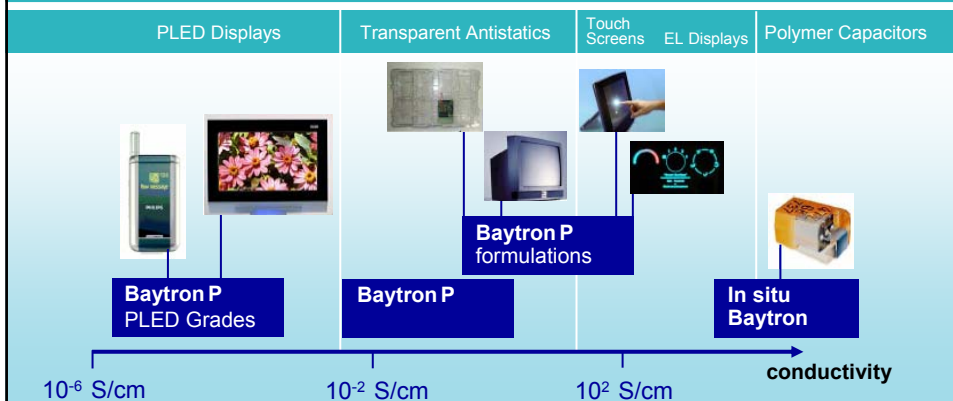
- Broad range of conductivity
- High transparency
- Good stability
- Ease in processing
- Safe handling



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Baytron – Cutting Edge Functional Material

Numerous Potential Applications



- Electroconductivity is a key functionality in electronic applications
- Different Baytron products covering a broad conductivity range
- Transparent, conductive surfaces using nano-scale films of Baytron open up new dimensions in display technologies

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Polymer Electronics – A new Generation of Electronic Devices



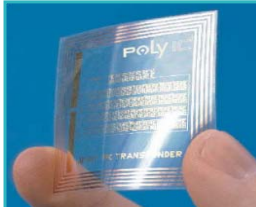
PLED

Source: Seiko Epson

Organic
Solar
Cell



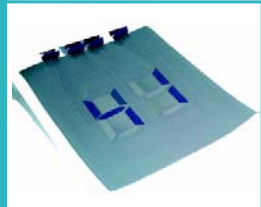
BAYTRON®



Organic
Transistor,
RFID

Source: Poly IC

Smart
Paper



Source: Acreo

Baytron as a potential key component in an emerging market

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Spearheading Innovation in Electro/Electronics



- Bayer is well positioned in the attractive growth market of electro/electronics applications
- Continuous life-cycle management makes Bayer's polycarbonate a resin of choice for present and future applications in optical data storage
- Innovations at Bayer are pushing the development of polymeric media for holographic data storage, setting new standards in storage capacity
- Bayblend demonstrates our capabilities to deliver tailored, high performance polymers
- Baytron, developed by Bayer, is a multi-functional, conductive polymer that opens up new fields of application in polymer electronics

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