The forward-looking statements are based largely on information available as of the date hereof, and are subject to risks and uncertainties which may be beyond company control. Actual results could differ largely, due to numerous factors, including but not limited to the following: Group companies execute businesses in many different fields, such as petrochemicals, carbon and inorganic products, information and electronics, pharmaceuticals, polymers and processed products, and these business results are subjected to influences of world demands, exchange rates, price and procurement volume of crude oil and naphtha, trend of market price, speed in technology innovation, National Health Insurance price revision, product liabilities, lawsuits, laws and regulations.
Agenda

- APTSIS 10 Current Status

- Business Topics
  - Carbon Business
  - Li-ion Battery Materials Business
APTSIS 10 Current Status

- Business Environment
- Acceleration of Restructuring Petrochemical Businesses
- Next-generation Growth Business
  - White LED Project
## Business Environment

### APTSIS 10 assumptions (May 13, 2008)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Assumptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic condition</td>
<td>Economic downturn</td>
</tr>
<tr>
<td>Naphtha price</td>
<td>68,000 yen/kl</td>
</tr>
<tr>
<td>FOREX</td>
<td>105 yen/US dollar</td>
</tr>
<tr>
<td>Intensifying competition in advanced materials</td>
<td>Identify seven next-generation growth businesses</td>
</tr>
<tr>
<td>Drug price revision in Japan</td>
<td>Every other year</td>
</tr>
</tbody>
</table>
| Supply volume increase from the Middle East | • Excess supply  
|                                          | • Global economic growth rate of 4.4%            |

### Current status (December 2008)

- **Global negative growth (’09-’10)**
- **No longer decoupling**
- **Weighted average of imported naphtha**
  - 4Q: 53,000 yen/kl (19,000 yen/kl*)
  - * Referring spot price as of Dec. 5
- **92 yen/US dollar (as of Dec. 5)**
- **Prioritization**
- **Every other year**
- **• Excess supply**
- **• Further damage caused by recession**
- **• Global economic growth rate of 2.8% or lower**

### Turning point

- **Identify seven next-generation growth businesses**
- **Prioritization**
- **Every other year**
## Business Portfolio: Current Status (December)

<table>
<thead>
<tr>
<th>Next-generation Growth Businesses</th>
<th>Existing Growth Businesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>White LED*</td>
<td>e.g.</td>
</tr>
<tr>
<td>Li-ion battery materials for HEVs*</td>
<td>Pharmaceuticals</td>
</tr>
<tr>
<td>Chemical components for automobiles</td>
<td>Food Ingredients</td>
</tr>
<tr>
<td>Sustainable resources</td>
<td>Recording media</td>
</tr>
<tr>
<td>Next-generation displays</td>
<td>Performance polymers</td>
</tr>
<tr>
<td>Organic photovoltaic modules</td>
<td>High performance graphite*</td>
</tr>
<tr>
<td>Personalized medicine</td>
<td>High performance polyester films</td>
</tr>
<tr>
<td></td>
<td>Electronic device components</td>
</tr>
<tr>
<td></td>
<td>C4 chemicals*</td>
</tr>
<tr>
<td></td>
<td>Polypropylene</td>
</tr>
<tr>
<td></td>
<td>Polycarbonate and bisphenol-A*</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Businesses to be Restructured</th>
<th>Stable Businesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>e.g. Terephthalic acid*</td>
<td>Blast furnace coke*</td>
</tr>
<tr>
<td></td>
<td>Olefins and aromatics*</td>
</tr>
</tbody>
</table>
## Business Environment of Petrochemicals

### Recognition on upcoming business environment
- Global economic growth rate is 2.8%/yr or lower (Further oversupply of price competitive Middle Eastern products)
- A sharp demand drop in automobile and IT industries

#### 2010 - 2011
Global ethylene operation rate of 80%

### Recognition on upcoming impact on Asian suppliers
- **C2 derivatives**: Operation rate 50 - 60%
  - Commodity products are dominated by middle eastern products
- **C3 derivatives**: Operation rate 80 - 85%
  - Compete by delivering high value-added products
- **C4 derivatives**: High value-added products are practically competitive

Can compete in C3/C4 derivatives market
Tough to compete in C2 derivatives market
Global Ethylene Supply/Demand Balance

Million ton

Ethylene operation rate expected w/ global expected growth rate of 4.4%

Ethylene operation rate expected w/global economical growth rate of 2.8%

Assumed operation rate based on current economical downturn

Source: Demand forecast by METI (as of May 28, 2008) & Internal forecast
Measures for C2 Derivatives

Accelerate the following items during APTSIS 10

- Withdraw weak C2 businesses
  - Raising profitability approx. by 10 billion yen

- Strengthen the foundation of polyethylene business
  - Consolidating production facilities & shifting to higher value-added products

- Optimize & reduce utility facilities
  - Reducing number of boilers & improving fuel conversion
    (improve approx. 10 billion yen)
  - Sharing utilities in petrochemical complexes through partnership & cooperation

- Asset lean
  - FY2010 target is approx. 200 billion yen reduction
    - Reduce inventories
    - Reduce common facilities, etc.
    - Transfer shares
    - Business withdrawals : ABS, α-olefin, etc.
### Timeline on Restructuring of Petrochemical Complexes

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td><strong>Linear alkylbenzene</strong></td>
<td>Mar. 2006: Production facility shutdown (surfactant)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Acrylonitrile</strong></td>
<td>Apr. 2006: Decrease share in Dia-Nitrix Co., Ltd. (50% to 35%)</td>
<td></td>
<td></td>
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<tr>
<td><strong>Melamine</strong></td>
<td>Mar. 2007: Production facility shutdown</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Acrylic acid, acrylic ester</strong></td>
<td>Sep. 2007: JV dissolution with Sasol Chemical Industries Limited (South Africa)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>Polystyrene</strong></td>
<td>Mar. 2008: Dissolution decision on HMT Polystyrene Co., Ltd. (Thailand)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Compounds, polyethylene</strong></td>
<td>Apr. 2008: Merger with Advanced Plastics Compounds Company in compounds business; Make Japan Polyethylene Corporation to a consolidated subsidiary of MCC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Polyvinyl chloride</strong></td>
<td>May 2008: PVC production facility shutdown: V-TEC Corporation's Mizushima Plant</td>
<td></td>
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<tr>
<td><strong>Styrene monomer</strong></td>
<td>Jul. 2008: Dissolution decision of Yuka Seraya Private Limited</td>
<td></td>
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<tr>
<td><strong>AO/HA</strong></td>
<td></td>
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<tr>
<td>(α-olefin)</td>
<td></td>
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<tr>
<td><strong>Ethoxylate</strong></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Dealing w/ customers and preparation for shutdown</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ABS</strong></td>
<td></td>
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<tr>
<td>(Techno Polymer Co., Ltd.)</td>
<td></td>
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<tr>
<td></td>
<td>Sale of shares</td>
<td></td>
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<tr>
<td><strong>Other C2 derivatives</strong></td>
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<tr>
<td><strong>PTA</strong></td>
<td></td>
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<tr>
<td></td>
<td>Shutdown studies and decision making; preparation for shutdown</td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Restructuring of petrochemical complex &amp; Partnership</strong></td>
<td></td>
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<tr>
<td></td>
<td>Restructuring of each petrochemical complex by partnership</td>
<td></td>
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</tr>
</tbody>
</table>
Building Competitive Business Structure

Business expansion with competitive derivatives

**Domestic**
- Build competitive olefin aroma center
  - High performance PP & PE, EO, and BPA
- Specialize in competitive derivatives
  - High performance PP & PE, Oxo products
- Specialize in high value-added products for automobiles and others
  - Compounds, films, 1,4-BG, PET, and PBT

**Overseas**
- Specialize in comparatively advantageous businesses
  - PC, C4 chemicals, PP & PP compounds

**Partnership**
- (Oil refineries, Petrochemicals)

**Accelerate R&D to diversify feedstock from naphtha**
- e.g. 1. Coke oven gas  →  Propylene (C1 chemical)
  2. Butene  →  Butadiene
  3. C2  →  1-Hexene

Mitsubishi Chemical Holdings Corporation
Business Topics

- Existing growth businesses
  - C4 Chemicals
  - Polycarbonate and bisphenol-A
- Business to be restructured
  - Terephthalic Acid
Existing Growth Business

C4 Chemicals (1,4-BG, PTMG)

Increase market exposure in expanding Asian market

- Complete No.1 PTMG plant in China as planned (3Q, FY2008)
- Establish a new ‘butene to butadiene’ process to secure butadiene (Operation confirmed by 200t/yr pilot plant)
- Supply raw materials for green sustainable plastic, GS Pla*

* Copolyester derived from succinic acid and 1,4-BG
Existing Growth Business

Polycarbonate and Bisphenol-A

Targeting high performance market segment in China

- Combine SINOPEC and Mitsubishi Engineering-Plastics Corporation’s sales channel & our R&D to increase market presence in China.
- Supply DPC (raw material, diphenyl carbonate) to China from No. 2 polycarbonate production facility (KP2) at the Kurosaki Plant in conjunction with China PJ.

China PC market growth forecast

- Initial forecasted growth rate: 7%
- Mid to long term of 8% growth rate

China Market

Asian share 20% or more

Mitsubishi Chemical Holdings Corporation

MEP Share 10%

'08 MEP Share 5%

China PJ

Start: Q2, 2010

Supplying Raw materiel DPC

China PJ

Beijing Yanhua

KP2

Start: April 2010

Melt Process PC 20KT

50KT

DPC 100KT

Melt Process PC 60KT

BPA 150KT

Outer sales

Supplying Raw materiel DPC

Outer sales

KT/Y


0 500 1,000 1,500 2,000 2,500

Optical Extrusion Medical Automotive E/E-OA Miscellaneous PC/ABS Bottles Growth Rate

80% 85% 90% 95% 100% 105% 110% 115% 120%

Initial forecasted growth rate

Mid to long term of 8% growth rate

Polycarbonate and Bisphenol-A
Business to be Restructured

Terephthalic Acid

Thorough cost reduction and alliances

- **Regional strategy**
  India, Indonesia, and China: Alliance with regionally-based company to leverage sales and production

- **Cost competitiveness**
  - Secure profit with 150$/t spread
    - Streamlining, etc. 4.5 billion yen (FY2008)
    - Variable cost reduction 3.0 billion yen (Investment 4 billion yen; within 2yrs recovery period)
  - Unprofitable production facilities are under review

- **Management by overseas global head quarters (GHQ)**
  - Manage procurement, sales, and technology
  - Streamline organization by human resource localization

---

Mitsubishi Chemical

GHQ
Business HQ / Technology HQ

NMC (China)  MCCI (Indonesia)  MCPI (India)  MCC Matsuyama (Japan)  SNC (Korea)
CAPEX and Investment & Loan

APTSIS 10 resource allocation revised

- **CAPEX and investment & loan**
  - Reduction by prioritization
    - 590 billion yen → 430 billion yen (−160 billion yen)
    - Performance Products: 210 billion yen
    - Health Care: 75 billion yen
    - Chemicals: 155 billion yen
    - Others: 150 billion yen
    - Total: 590 billion yen

- **Strategic investment & loan**
  - 250 billion yen (guide line) + α

- **R&D expenses**
  - Prioritize
    - 425 billion yen → 405 billion yen (−20 billion yen)

White LED and Li-ion battery materials will be top priority among the seven next-generation growth businesses.
Seven Next-generation Growth Business

Prioritize in white LED and Li-ion battery material for HEVs
White LED Project

- **White LED Technology**
- **Chip Technology**
- **Phosphor Technology**
- **Gallium Nitride (GaN) Substrate**
- **Semiconductor Materials Technology**

**Applications**:
- Next-generation DVD
- Short wavelength laser diodes
- Next-generation transistors
- Automotive light source
- Lamp
- Total market size in 2010: 1 trillion yen
Business Expansion Flow

Materials  Parts  Components  Final Market

GaN Substrate Business

- GaN Substrate
  - Sale
  - Self-manufacture

Device Business

- Chip
- White LED

Phosphor Business

- Phosphors
- White LED manufacture

Automotive transistor
Insulated-gate bipolar transistor (IGBT)

Blue & green laser diode

White LED Lamp
Lighting equipment
Back light for LCD

Market Size (2015)

- 1 trill. yen
- 2 trill. yen

White LED manufacture
Update on GaN Substrate

Vapor deposition method

2” c-plane (production stage)

Full-scale sales

- Achieve high output
- Surpassing competitor’s surface quality

2nd to launch in the market

m-plane (development stage)

World’s 1st to successfully develop nonpolar & semipolar crystal plane

- More efficient than current products
- Possible to be used for green laser
- Collaboration with UCSB (Prof. S. Nakamura’s team) 
  <hold wide range of patents>

- Mass Production (2009)
- Replacing c-plane, aim to lead the market (target 2015)
Update on GaN Substrate

Liquid phase growth method

Progress

- Joint development w/ Prof. S. Nakamura’s team (Ammono-Thermal)
- MCC’s proprietary production process (Chemical equilibrium method: G-CHEM)
  ⇒ Currently at a small size crystal formation stage, similar luminescence to vapor deposition method

Features and Purpose

- Bulk production ⇒ Ultra low cost
- Large diameter ⇒ Driver to expand the next-generation transistor market (e.g. automotive transistor: IGBT)

Si → SiC (silicon carbide) → GaN

Target to lead the market by 2015 through supplying m-plane substrate (ultra high performance), using liquid phase growth method (ultra low cost)
Update on Phosphors

Activated the market

- Adopted for LED lighting
- Adopted for LED backlights

Substitute incandescent light bulbs (energy conservation, CO₂ reduction)
Key LED materials for LCD backlights

Progress

- Dominant world wide share in RED; expanding sales in GREEN
- Merge Kasei Optonix, Ltd. with Mitsubishi Chemical to integrate sales, production and R&D (April 2009)
Business Scope

From materials to Chip/LED components business

Mar. 2008  Acquired patent for near-UV (nUV) white LED Chip & production facilities from Mitsubishi Cable Industries, Ltd.

Aug. 2008  Started production & Sales of Chip (for lighting purpose)

2010 - Utilize cutting edge materials to create and lead nUV LED market
MCHC Group
Carbon Business

Masanori Karatsu
Executive Officer
Chief Operation Officer, Carbon Division
Mitsubishi Chemical Corporation
Agenda

- Carbon Business - History and its Product Chain
- Business Performance
- Carbon Production Base
- Basis and Key Business
  - Blast Furnace Coke
- Existing Growth Business
  - High Performance Graphite
- Fusion of Carbon Chemistry and Petrochemicals
  - Carbon Oven Gas
Carbon Business and Product Chain

Carbon allotrope: diamond and fullerene

- **Raw Materials**
  - Coal: 9,300KT

- **Products**
  - Blast Furnace Coke: 6,400KT
    - Sakaide
    - Steel
  - Coke Oven Gas, COG: 1300MNm3
    - Kakogawa
    - Power generator
  - Needle Coke*: 300KT
    - Sakaide
    - High performance graphite, Electrode, Atomic energy, Semiconductor
  - Carbon Fiber*: 1,000T
    - Sakaide
    - Robot arm, Construction
  - Carbon Black: 200KT
    - Yokkaichi
    - Tire/ink

- **Plants**
  - Blast Furnace Coke: Sakaide
  - Coke Oven Gas, COG: Kakogawa
  - Needle Coke*: Sakaide
  - Carbon Fiber*: Sakaide
  - Carbon Black: Yokkaichi

- **Usage**
  - Steel
  - Power generator
  - High performance graphite, Electrode, Atomic energy, Semiconductor
  - Robot arm, Construction
  - Tire/ink

- **Coal Tar**
  - 300KT
    - 1938 Start up at the Kurosaki Plant - Basis Business for 70 years
    - Liquefaction & carbonization
    - Creosote Oil: 100KT
      - Vaporization & Carbonization
      - Carbon Black: 200KT
      - Kurosaki
      - Tire/ink

- **Existing growth business in APTSIS 10**

Mitsubishi Chemical Holdings Corporation
Locations – Carbon Products Business

- Steel Works
- Mitsubishi Chemical Coke Plants

Kansai Coke and Chemicals Co., Ltd. (Kakogawa, Amagasaki) JV with Kobe Steel, Ltd. since 1956

Steel Works in Setonaikai Area: Oita, Yahata, Tobata, Kokura, Kure, Fukuyama, Kurashiki, Hirohata, Kakogawa, Kobe, Sakai, Wakayama

Nihon Kasei Chemical Co., Ltd. (Onahama) since 1959

Sakaide since 1969

Yokkaichi

Head Office

Carbon black, Synthetic rubber
Business Performance (2002 - 2008)

Rapid growth in China from 2003
- The domestic production of crude steel has expanded to 120 million tons
- Coal & iron ore markets became tight, leading to price hike

Operating profits and coking coal price
1980 - 2008

- Operating Profits
- Coking Coal Price

Crude Steel Production
Sales
Coking Coal Price
Operating Profits
Carbon Production Base, Sakaide Plant

Carbon Fibers  Needle Coke  Coking Coal from Australia

'BCarbon Production Base'  Since 1969  Sakaide Plant

Blast Furnace Coke
World Crude Steel Production

Rapid expansion of Chinese crude steel production now large production reduction

World Crude Steel Production

Million ton

2003 2004 2005 2006 2007 2008 forecast

Japan US Europe China

220 270 350 420 490 540

480

as of Dec.,08

MCC Contract FOB Coke Price for CY2008

Source: Statistics of Chinese Custom
Basis & key business:
Blast furnace coke

Coal
Coke oven

Coke oven

COC

CO2

Tar

Dry distillation

Coke

R&D ‘clean energy’, H2: 60%

R&D-1:
COG ↔ benzene ↔ methanol
COG ↔ DME ↔ propylene

R&D-2:
C1 chemistry, utilize CO2
H2, C, and heat used for deoxidization

Existing growth business:
High performance graphite

Global shortage of needle coke:
Electrode for steel production & specialty application
Rapid growth of carbon fiber demand

R&D-3:
✓ Improve pitch purification efficiency
✓ Capacity increase by 25%

Competitiveness depends on tar and COG.

Blast furnace coke:
Recent high growth caused by strong Chinese demand lead price hike of coking coal and coke. Steel production, however, are slowing down.

Domestic customers: Nippon Steel, Sumitomo Metals, Kobe Steel, and Nisshin Steel
(for competitive high grade steel)

Export: US, EU, and Brazil
High Performance Graphite

Distillation

Coal tar

Coal tar pitch

Purification

Spinning-carbonizing

Delayed Coking Calcinations

Carbon fiber

Compound materials

Needle pitch coke

Applications

- **Graphite electrode for electric arc furnace steel making**
  - Competitive steel products, depending on prices of scrap & electricity
  - Increasing demand

- **Various electrode and electric brush**
  - Advancement of electrical application

- **Semi-conductor application**
  - Increasing demand on crucibles for silicon pulling furnace

- **Atomic power core material, pantograph slider and sealing material**
Needle Coke Applications

**Needle Coke**

Artificial graphite features heat, acid, and chemical resistant, electrical conductivity, thermal conductivity, and lubrication.

- **Graphite electrode for electric arc furnace steel making**
  - Competitive steel products (depending on prices of scrap & electricity)
  - Increasing demand

- **Various electrode and electric brush**
  - Advancement of electrical application

- **Semi-conductor application**
  - Increasing demand on crucibles for silicon pulling furnace

- **Atomic power core material, pantograph slider, and sealing material**
High Performance Graphite - Capacity Increase

**APTSIS 10** Capex: 4 billion yen

- **Needle coke for graphite electrode**
  - +15,000t/y; share +10%
- **Pitch base coke for special carbon products for semiconductor applications and atomic power core material**
  - +6,000t/y; share +10%
- **Pitch base carbon fiber**
  - +10,000t/y; increase carbon fiber capacity to 1,300t/y

To be completed in Aug. 2010
Fusion of Carbon Chemistry and Petrochemicals

Carbon Chemistry

<table>
<thead>
<tr>
<th>Coke Oven Gas</th>
<th>H2  58%</th>
<th>CH4 28%</th>
<th>CO  7%</th>
<th>N2  2%</th>
<th>CmHn 4%</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
<td></td>
<td></td>
<td>1,300MNm³</td>
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</tbody>
</table>

Petrochemicals

- Clean Energy
- C6H6 Benzene 300KT
- Methanol
- Dimethyl Ether
- Propylene 300KT

Methane to benzene
Sakaide Plant
Coke Oven Gas → Methanol

Mizushima Plant
DME → Propylene

Accelerate establishment of manufacturing process
Confirmation by pilot plant

CO2 reduction by 220,000 ton
Decrease by 135,000 ton vs. naphtha cracker

Add Value to Coke Oven Gas
Coke Oven Hot-renewal Start up from 2008

Renewing bricks of No.6 flu edge

Renewing backstay & protective hardware

Parts: Renewing bricks

from ‘08: 5.8 billion yen/28 ovens
from ‘11: 2.0 billion yen/16 ovens
from ‘12: 2.5 billion yen/22 ovens
APTSIS 10 Carbon Business Summary

- **Plant measures**
  - Coke oven hot-renewal to ensure reliability

- **Environment measures**
  - Desulphurization
  - Dust catcher
  - Prevention of marine pollution

- **Demand expansion**
  - Further expansion in exportation of needle cokes for special steel

- **Add value for COG**
  - Completion of technological development of COG to propylene

- **High Performance Graphite**
  - Capacity increase by 25%

- **Energy Efficiency**
  - Streamline and improvement
  - CO₂ reduction
MCHC Group
Li-ion Battery Materials Business

Shigeru Tsuyuki
Managing Executive Officer
Chief Operation Officer, Performance Products Division
Mitsubishi Chemical Corporation
Agenda

- What is Li-ion Battery?
- Li-ion Battery Market
- Li-ion Battery Materials Market
- MCC’s Battery Materials Business Activity
- MCC’s Battery Materials Strategy
What is Li-ion Battery?

Working Principals

Li-ion transfers from Cathode to Anode when the battery is charged.

Li-ion transfers from Anode to Cathode when the battery is discharged.
What is Li-ion Battery?

Structure

18650 Cylindrical electrode

18650 Cylindrical cells
What is Li-ion Battery?

Applications

For High Capacity

For High Power
Li-ion Battery Market

Domestic sales

(Yen/Cell) (Mil. Cells)

No. of cells  Amount  Ave. Price

(Billions of yen)

Data source: METI
Mitsubishi Chemical Holdings Corporation
Estimated market for LiB HEV/EVs

- Start up
- Popularization

Will LiB-HEV/EV boom beyond 2015?
Li-ion Battery Materials Market

<table>
<thead>
<tr>
<th></th>
<th>2007</th>
<th>2010</th>
<th>2015</th>
<th>2020</th>
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<tbody>
<tr>
<td>Consumer</td>
<td>200.0</td>
<td>250.0</td>
<td>300.0</td>
<td>310.0</td>
</tr>
<tr>
<td>HEV</td>
<td>—</td>
<td>5.0</td>
<td>100.0</td>
<td>650.0</td>
</tr>
<tr>
<td>MCC (share)</td>
<td>10.0 (5%)</td>
<td>17.0 (6%)</td>
<td>50.0 (12.5%)</td>
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</tr>
</tbody>
</table>

LiB material market may expand double by 2015 and 5x by 2020
## MCC’s Battery Materials Business Activity

### Our Products

<table>
<thead>
<tr>
<th>Product</th>
<th>Phase</th>
<th>Place of Production</th>
<th>Market Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrolyte</td>
<td>Business</td>
<td>Yokkaichi, Suzhou</td>
<td>20-25%</td>
</tr>
<tr>
<td>Li salt (LiPF6)</td>
<td></td>
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<tr>
<td>Solvents (EC, DMC)</td>
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<tr>
<td>Additives</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Anode</td>
<td>Business</td>
<td>Sakaide</td>
<td>10-15%</td>
</tr>
<tr>
<td>Amorphous carbon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Natural/Artificial</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Graphite</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cathode</td>
<td>Business</td>
<td>Sakaide, Mizushima</td>
<td>&lt;5%</td>
</tr>
<tr>
<td>Li compound made up of Ni, Mn, Co</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Separator</td>
<td>Development</td>
<td>Nagahama</td>
<td>-</td>
</tr>
<tr>
<td>Micro porous film made of polyolefin</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
MCC’s Battery Materials Business Activity

**Electrolyte**
High-performance additives based on;
- Molecular design
- Organic synthesis
- Battery evaluation technologies

**Anode**
Customizing the material by controlling;
- Amount of coating material
- Particle size
- Particle form
- Specific surface area, etc.

**Cathode**
- Ni, Mn rich type
- Pore structure in the secondary particle is designed to improve Li-ion diffusion, enabling high power.

**Separator**
Solvent-free three-dimensional micro porous structure having;
- High power at low temperature
- Cyclic life
- High temperature storage
MCC’s Battery Materials Business Activity

Synergy of product development in MCHC Group

Sales: MCC
Multiple sales channel

Production: MPI
Micro porous film design
Mass production

Evaluation: MCRC
Product design
Battery testing

e.g. Separator
## Capital Expenditures Planned (2008-2010)

<table>
<thead>
<tr>
<th>Estimated Amount</th>
<th>Launch</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrolyte</td>
<td>Jan. 2010</td>
<td>2,500 MT/Y</td>
</tr>
<tr>
<td>Anode</td>
<td>Oct. 2009</td>
<td>2,000 MT/Y</td>
</tr>
<tr>
<td>Cathode</td>
<td>Oct. 2009</td>
<td>600 MT/Y</td>
</tr>
<tr>
<td>Separator</td>
<td>Jul. 2009</td>
<td>12 mil. m²/Y</td>
</tr>
</tbody>
</table>

Electrolyte and Anode capacity increase includes de-bottling of current lines.
MCC’s Battery Materials Business Activity

Battery Evaluation & Safety Analysis

Simulation

- Dynamic behavior of Electric cell
  - Heat generation
  - Temperature
  - Heat transfer
  etc.

Analysis

- Thermal properties
- Calorimetry
- Electrical resistance
- Output power
  etc.

Testing

- Short circuit
- Overcharging
- Heating
  etc.

Safety engineering for innovation of new materials
MCC’s Battery Materials Business Activity

R&D Activities

One of the top applicants of LiB related patents and original papers

Number of open-laid patents applied (Japan)

Number of original paper

“IC = H01M10/40”
18,692 applications (67% covered by Top 13)

CA PLus DB (1907 - 2007/5/18)
“Li + lithium”
x “battery + cell + electrode + electrolyte”
x “journal + letter”
55,730 papers (1.7% covered by Top 13)
Material development
(Present)
Focused on optimizing each material’s performance

Material development
(Future)
In addition, optimizing the combination of materials

By having four key materials in-house, we offer total solution for high performance battery.
MCC’s Battery Materials Business Activity

Our Business Model

Material development and manufacturing

- Anode
- Cathode
- Electrolyte
- Separator

Evaluation of model cells

Analysis

Safety analysis

Battery Manufacturers
MCC’s Battery Materials Strategy

- MCC will become a total solution provider of 
  LiB materials such as 
  * Electrolyte  * Anode  * Cathode  * Separator 
  With supporting technology and know-how of 
  * Battery evaluation  * Battery analysis

- Target sales and operating income in 2015 
  Net Sales JPY50.0 Billion, ROS 10%