BASF Battery Materials: Driving electromobility

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Cautionary note regarding forward-looking statements

This presentation contains forward-looking statements. These statements are based on current estimates and projections of the Board of Executive Directors and currently available information. Forward-looking statements are not guarantees of the future developments and results outlined therein. These are dependent on a number of factors; they involve various risks and uncertainties; and they are based on assumptions that may not prove to be accurate. Such risk factors include those discussed in the Opportunities and Risks Report from page 111 to 118 of the BASF Report 2017. BASF does not assume any obligation to update the forward-looking statements contained in this presentation above and beyond the legal requirements.
BASF has the broadest offering to the automotive industry

Surface treatment, coatings, pigments
Headliner
Dashboard
Door side part
Window encapsulation
ABS cable
Air intake manifold, charge-air lines
Battery materials
Mounts for powertrain
Lubricants, engine coolants, engine cover
Air-filter housing
Oil pan
Spoiler, lower bumper stiffener
Brake fluids

Steering wheel
Headrests
Roof module
Hatrack
Catalysts
Fuel additives
Carpet, floor mats
Seats, handrests, armrests
Cross beam
Wheel rim

Suspension: jounce bumper, top mount, coil spring isolator
Electromobility is a net positive for chemicals demand per car

<table>
<thead>
<tr>
<th>Category</th>
<th>Internal Combustion Engine (ICE)</th>
<th>Battery Electric Vehicle (BEV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emissions control and power generation</td>
<td>Higher demand</td>
<td>+</td>
</tr>
<tr>
<td>Engineering plastics</td>
<td>Higher demand</td>
<td>+</td>
</tr>
<tr>
<td>Coolants</td>
<td>Comparable demand</td>
<td>−</td>
</tr>
<tr>
<td>Coatings</td>
<td>Comparable demand</td>
<td>−</td>
</tr>
</tbody>
</table>

- Catalysts
- Cathode Active Material (CAM)
- Coolants
- GLYSANTIN
BEVs and hybrids create opportunities in battery materials
But demand for catalysts will outgrow ICE** vehicle production for another decade

** ICE: Internal combustion engine

BEVs with strongest growth rate, ICEs expected to stagnate

Catalysts unit growth driven by regulations globally, further momentum from heavy duty, especially in Asia

Global vehicle production by engine type

- BEVs: Battery Electric Vehicles
- Hybrids: ICE + Battery
- ICE only

Mobile emissions catalysts market

- Global Catalyst Market

* Data source: LMCA

\[ \text{BEVs: Battery Electric Vehicles} \quad \text{Hybrids: ICE + Battery} \quad \text{ICE only} \]

\[ \text{Global vehicle production by engine type} \quad \text{million units} \]

\[ \text{Mobile emissions catalysts market} \quad \text{million units} \]

\[ \text{BEVs with strongest growth rate, ICEs expected to stagnate} \]

\[ \text{Catalysts unit growth driven by regulations globally, further momentum from heavy duty, especially in Asia} \]
Capturing the fast-growing battery materials market

Electromobility drives battery materials growth

Chemistry of cathode active materials is key to address electromobility challenges

Market projections for 2025*:
- 10-15 million electric vehicles built per year
- 700-1,000 kt of CAM in electromobility
- €25-30 billion CAM market size

* Electric vehicles: BEV and PHEV; numbers capture various growth scenarios and BEV vs. PHEV ratios
Shaping the future of electromobility with cathode active materials
BASF drives electromobility
With holistic offer to address key customer needs

- Global manufacturing presence, regional footprint
- Innovative and reliable processes with highest single-train capacities
- Strong pipeline to invest for growth
- Secure supply chain

- Broadest commercialized portfolio of nickel-rich CAM
- Customer proximity of development teams
- Toolbox for CAM customization
- Strong product and process development pipeline
- Extensive IP portfolio
BASF drives key cathode chemistries to improve energy density, lifetime and cost
BASF family of cathode active materials is matching all cell formats
Comprehensive toolbox developed to further customize performance requirements

- Morphology, chemical composition and powder processing are key levers to achieve optimal performance
- CAM materials under development will need to provide optimized balance of energy density, cost and stability

- BASF already supplies various CAM into all cell formats
- All future BASF CAM will be customized for optimized use in different cell formats
Fast-paced buildup of global CAM footprint and scale to win
Already supplying leading cell producers and OEM platforms, secure supply to growing customer base

- First production volumes at Harjavalta, Finland (Europe)
- First CAM production facility in Elyria, Ohio (North America)
- Foundation of BASF Toda Battery Materials (BTBM), Japan
- Tripled capacity at BTBM in Onoda, Japan
- Second CAM production facility in Battle Creek, Michigan; merged with Elyria, Ohio into BASF Toda Americas (BTA)
Latest news: European investments
Foundation for a truly unique value proposition in Europe

BASF and Nornickel join forces to supply the battery materials market

- BASF announces first location for battery materials production in Europe
- BASF and Nornickel establish a strategic cooperation to meet the growing needs for battery materials in electric vehicles

Ludwigshafen, Germany, and Moscow, Russia, October 22, 2018 – BASF has selected Harjavalta, Finland, as the first location for battery materials production serving the European automotive market. The plant will be constructed adjacent to the nickel and cobalt refinery owned by Norilsk Nickel (Nornickel).
Latest news: China
Further strengthening our footprint in Asia

BASF and SINOPEC sign Memorandum of Understanding to expand cooperation in China

Ludwigshafen, Germany and Nanjing, China – October 29, 2018 – BASF and SINOPEC have signed a Memorandum of Understanding (MoU) in Beijing to further strengthen their partnership in upstream and downstream chemical production in China. The partners intend to build an additional steam cracker and to further expand their existing 50:50 joint venture, BASF-YPC Company, Limited (BASF-YPC). A joint pre-feasibility study will be concluded by the end of 2018. Additionally, the two companies will jointly explore new business opportunities in China’s fast-growing battery materials market.

The partners are also jointly exploring new business opportunities in battery materials. The rising importance of alternative energy in China, especially in the automotive industry, has led to a surge in demand for innovative battery materials for a range of applications.
BASF Battery Materials in pole position

- Broadest high energy density CAM portfolio
- Tailored solutions to strong customer base
- Established manufacturing know-how
- Strong innovation and growth pipeline
- Global presence and secure supply chain
- Long-standing strategic partnerships

BASF cathode active materials (CAM)
- Nickel-Cobalt-Manganese (NCM)
- Nickel-Cobalt-Aluminum (NCA)

Battery pack
Battery cell
Electrolytes
Anode active materials
Separator