

BASF Research Press Conference  
on May 27, 2014

## Nanotechnology

Small Dimensions – great opportunities



**Dr. Andreas Kreimeyer**

Member of the Board and Research Executive Director, BASF SE, Ludwigshafen

## Innovation

Rethinking materials



## “We create chemistry” strategy

Innovation is our lifeblood



### R&D 2013 at a glance

1. R&D expenditures of circa €1.8 billion, further increase planned in 2014
2. Launch of >300 new products
3. Leading in Patent Asset Index™
4. Numerous innovation awards
5. Global R&D network strategically strengthened
6. Growth fields bring our strategy to life

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## Innovation at BASF

R&D 2013 at a glance



Research for the future: with our innovative products and processes, we provide sustainable solutions for global challenges.

- Expenditures for R&D circa €1.8 billion
- Around 10,650 employees worldwide involved in research and development
- Around 3,000 research projects
- 1,300 new patents registered in 2013
- Global Know-how Verbund with 600 excellent partners from universities, industry, high-tech joint-ventures and start-up companies



1	Chemicals	10%
2	Performance Products	20%
3	Functional Materials & Solutions	20%
4	Agricultural Solutions	26%
5	Oil & Gas	3%
6	Corporate Research, Others	21%

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## Innovative portfolio

New products launched by BASF in 2013



CathoGuard® 800



Four-Way Catalyst



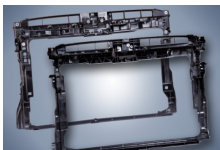
Slentite™



Lumina® Royal



Genuity®  
DroughtGuard®



Ultrasim®/  
Ultracom™



Zetag® ULTRA



Luviset® one



Ecovio®  
Coffee capsules



Bio-based  
Succinic acid

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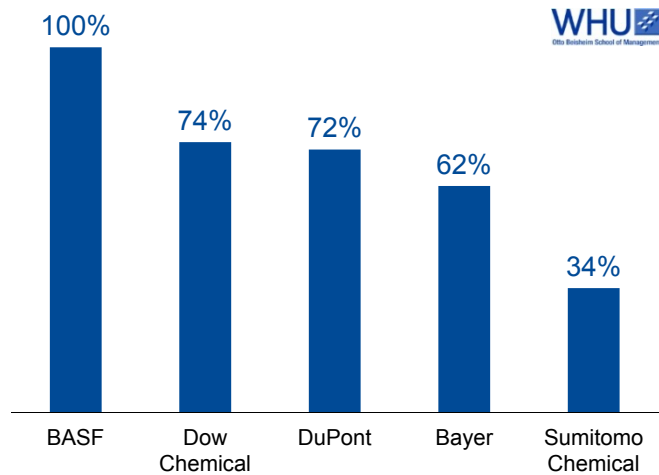
## Innovative portfolio

Leading in the patent asset index



### Patent Asset Index™

- BASF leading for the fifth year in a row
- Measures strength of a company's patent portfolio in global markets
- Takes into account relevance of patents (normalized number of citations)
- Factors in market size covered by individual inventions (expressed by Gross National Income)



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## Innovative portfolio

Acknowledged by industry and governmental organizations



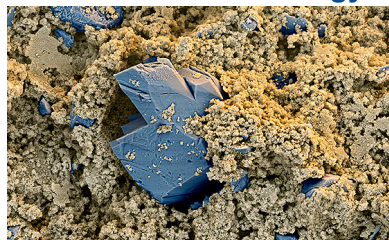
### Selected awards in 2013

#### SPE European Automotive Division Award



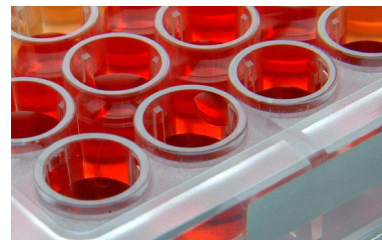
for lightweight structural elements

#### Innovation Prize for Concrete Technology



for concrete technology Master X-Seed®

#### Animal Protection Research Prize



by German Federal Ministry of Food, Agriculture and Consumer Protection

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## “We create chemistry” strategy

Innovation is our lifeblood



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### 5. Global R&D network strategically strengthened

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6. Growth fields bring our strategy to life

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## Global R&D network strengthened

Within past 12 months



By 2020, BASF plans to conduct 50% of its R&D outside of Europe to gain local access to customers, talents and innovation centers.

### CARA

California Research Alliance



### San Diego

Verenum Corporation



**Research Triangle Park**  
New Research Facilities



● New center, site or expansion ● Most important R&D sites



### NAO

Network for Advanced Materials Open Research



### Amagasaki

Laboratory for Battery Materials



### Mumbai

Global R&D Center

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## “We create chemistry” strategy

Innovation is our lifeblood



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6. **Growth fields bring our strategy to life**

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# Chemistry-based innovations

Growth and technology fields

## Global needs

Resources,  
Environment  
& Climate

Food &  
Nutrition

Quality of Life

## Key customer industries



Transportation



Agriculture



Construction



Energy & Resources



Consumer Goods



Electronics



Health & Nutrition

## Growth fields

Batteries for Mobility

Enzymes

E-Power Management

Functional Crop Care

Heat Management for Construction

Lightweight Composites

Organic Electronics

Plant Biotechnology

Water Solutions

Wind Energy

...

## Technology fields

Materials, Systems  
& Nanotechnology

Raw Material Change

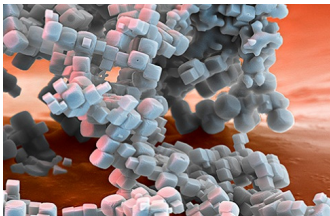
White  
Biotechnology

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# Technology Fields

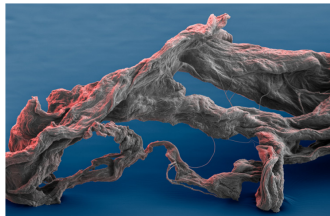
Provide solutions for our growth fields

## Raw material change



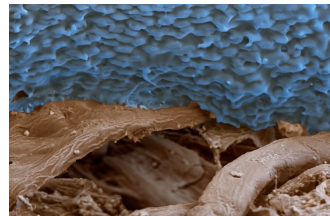
- Natural gas to olefins
- Natural gas to aromatics
- Bio-based superadsorbent polymers

## White biotechnology



- Bio-based succinic acid
- Detergent enzymes
- Schizophyllan for enhanced oil recovery

## Materials, Systems & Nanotechnology



- Novel membrane materials
- Biodegradable polymers
- Smart-scale production

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# Nanotechnology

Key enabler for a sustainable future

## Approach

- **Preparing nano-structured surfaces and materials**  
→ Extraordinary, new properties

## Benefits

- **Effective health protection**  
→ Nanoformulation for improved release of pharmaceuticals
- **Energy-efficient construction**  
→ Fastened concrete hardening
- **Regenerative power generation**  
→ High-performance materials for organic photovoltaics
- **Low-emission e-mobility**  
→ Intelligent materials for powerful batteries
- ...



► Solutions for health, energy & resources, climate protection, construction, automotive, ...

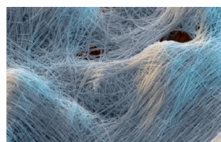
# Nanotechnology

Small dimensions enable remarkable solutions

## Research pipeline



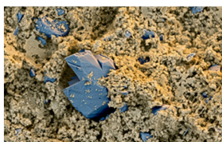
Colorants



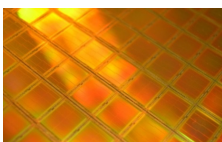
Anode materials



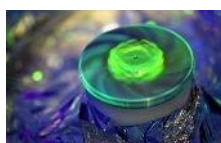
iGloss®



Master X-Seed®



Planapur®



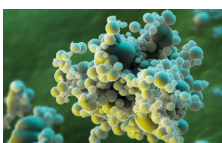
Solar cells



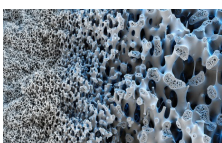
OLEDs



Slentite™



Carbonyl iron SQ-I



Multibore®

## Growth field Batteries for Mobility

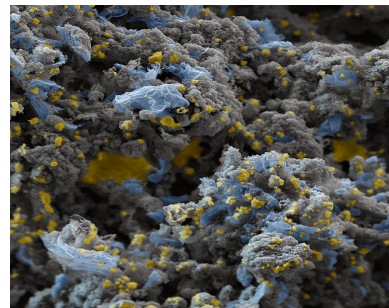
**Innovative materials of BASF will enhance battery life time and reduce costs with no compromises on safety.**

### Existing activities

- Chemicals and materials for lithium-ion batteries (cathode and anode materials, electrolytes, binders, solvents)
- Work on concepts for next generations of batteries (lithium-sulfur)

### Targets

- Position BASF as a leading battery materials and components supplier
- Find innovative solutions for future mobility



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## Growth field Enzymes

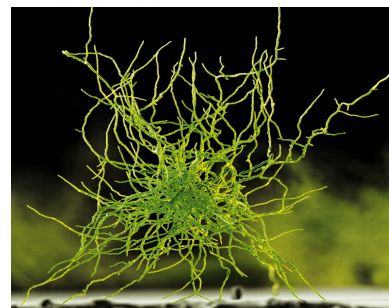
**Enzymes from BASF enable innovative product and system solutions for various customer industries.**

### Existing activities

- Enzymes for animal nutrition (phytase, glucanase, xylanase)
- Enzyme platform through several acquisitions established

### Targets

- Position BASF as an integrated enzyme supplier in strategically important markets (animal nutrition, detergents and cleaning agents, food and baking industry)
- Access new markets, e.g. in water treatment and oilfield chemicals



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## Growth field E-Power Management

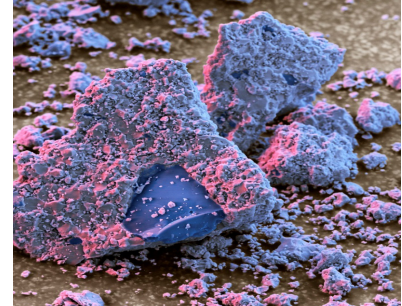
**BASF develops innovative solutions to increase energy and CO<sub>2</sub>-efficiency in the power value chain.**

### Existing activities

- Solid state materials for efficient cooling
- High temperature superconductors for efficient current conduction
- Stationary power storage in the grid

### Targets

- Development of material based breakthrough technologies for use in the power value chain
- Development of new markets in power generation, power transmission, stationary storage and power usage (cooling and heating, electric motors)



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## Growth field Heat Management for Construction

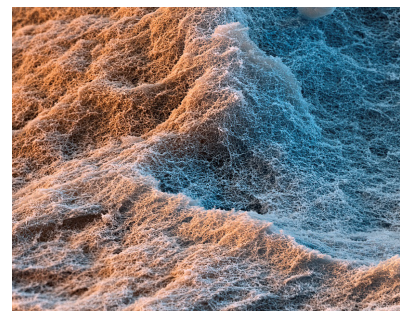
**Intelligent solutions from BASF for heat management improve the energy efficiency of buildings.**

### Existing activities

- Solutions for heat insulation and energy saving in the building shell
- High-performance insulation materials with nanostructures
- Solutions for management of light and heat radiation
- Noncombustible insulation foams

### Targets

- Position BASF as leading supplier of innovative heat insulation materials
- Build up know-how for integrated heat management solutions



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## Growth field Lightweight Composites

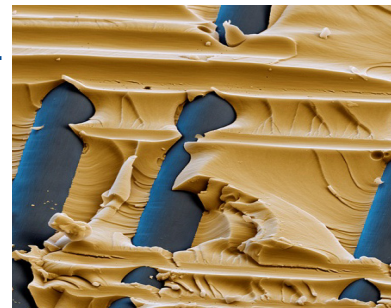
**Innovative composite materials from BASF are helpful in automotive lightweight construction and in reducing carbon emissions.**

### Existing activities

- Replacing metal with short and long glass fiber reinforced plastics, polyurethanes and foams
- Replacing metal in structural applications (frame, passenger compartment) with continuous fiber-reinforced composite materials
- System solutions: tailored multi-material systems (polymer systems and fibers, sandwich systems)

### Targets

- Position BASF as one of the leading suppliers of composite material systems
- Extending existing business and accessing new markets by utilizing synergies between different material systems



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## Growth field Organic Electronics

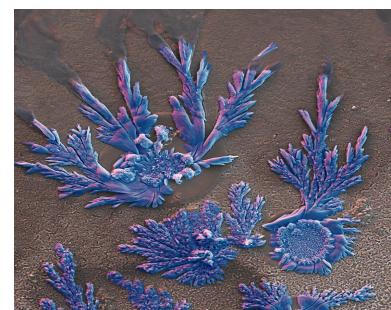
**BASF provides material systems solutions for mass applications in organic electronics.**

### Existing activities

- Material systems for OLEDs (displays and lighting)
- Printable materials for circuit boards and displays

### Targets

- Position BASF as provider of material solutions for next generation displays and lighting
- Creating system know-how and technology synergies in synthesis, formulation and up-scaling
- Enter new markets based on BASF's core competencies



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## Growth field Plant Biotechnology

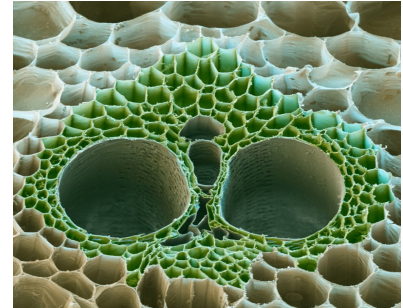
### **BASF focuses on sustainable intensification of agriculture and healthy nutrition.**

#### Existing activities

- Development of drought-tolerant corn together with Monsanto
- Development of herbicide-tolerant soybeans together with Embrapa
- Development of fungal-resistant crops
- Development of healthy EPA/DHA Omega-3's in canola with Cargill

#### Targets

- Position BASF as “The Trait Technology Partner” in collaboration with leading market players
- Improve yield and quality of major crops such as corn, soybean and rice



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## Growth field Functional Crop Care

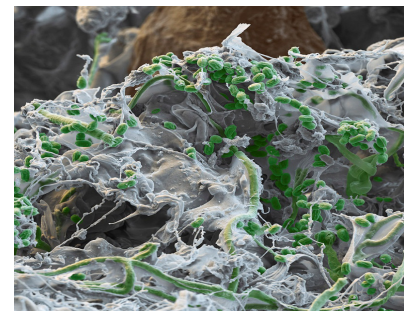
### **BASF offers farmers biological solutions beyond conventional crop protection for plant health and increased yield potential.**

#### Existing activities

- Products with a positive effect on plant physiology (AgCelence® umbrella brand)
- Holistic solutions for seed applications (e.g. inoculants)
- New technologies for biologicals

#### Targets

- Position BASF as a supplier of integrated solutions for farmers (greater plant vitality, better quality, improved stress tolerance, higher productivity)
- Sustainable solutions in the areas of crop care, soil management and seed treatment



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## Growth field Water Solutions

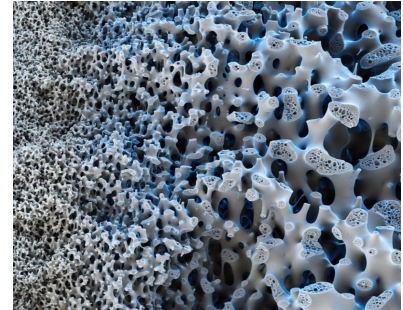
**BASF's chemistry will contribute significantly to innovative solutions to close the water supply gap.**

### Existing activities

- High-performance and environmental-friendly flocculants
- Corrosion inhibitors and antiscalants for industrial water management applications
- Antiscalants and cleaners chemicals for desalination and membrane applications
- High performing membrane technologies (ultrafiltration)

### Targets

- Position BASF as leading provider of innovative chemical solutions to the water industry worldwide
- Create synergies between equipment and chemicals for improved water treatment solutions
- Help our customers to implement solutions for water recycling and reuse, water savings and drinking water treatment



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## Growth field Wind Energy

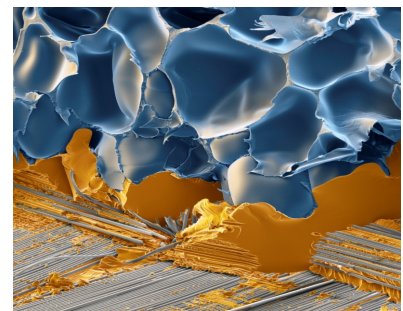
**BASF develops innovative solutions for the use of wind power as a climate-friendly source of energy in the energy mix.**

### Existing activities

- Matrix systems, adhesives, structural foams and coatings for blades
- Hydraulic fluids and gear lubricants for nacelle
- Grouts and admixtures, coatings for tower and base

### Targets

- Further strengthen BASF's position in the wind energy industry
- Development of intelligent, customized solutions for efficient construction and maintenance of wind power plants



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The Chemical Company