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## Biofuels Technology Roadmap: “Cleaner Transport: Powering Transportation with Cleaner Fuels”

- Biofuels enable considerable GHG reduction in the transportation sector and contribute sustainably to energy security and socioeconomic development.
- The chemical industry can play a role in realizing a sustainable future that is targeted toward biofuels and bioenergy production.

### ***ICCA efforts to Develop Biofuels Technology Roadmap***

- ⇒ ICCA helped develop a “Biofuels for Transport” roadmap with IEA to set up a potential scenario to meet CO<sub>2</sub> emission reduction goals.
- ⇒ The roadmap clearly acknowledges the importance of the chemical sector both in terms of R&D investments and core technology components, such as tar-free syngas production and bioethanol from the conversion of cellulose to sugar.

### ***Efficiency***

- Membrane technologies reduce the energy required to recover ethanol from fermentation broth and make the process more efficient.
- The chemical industry’s ability to achieve and integrate heat transfer in processing plants reduces the cost of materials and operations.
- Incorporating such integration for combined heat, power and fuel production can improve the efficiency of biofuels manufacture and support energy crops from agriculture and aquaculture.

### ***Technology***

- The chemical industry developed and uses catalytic processes critical to biofuels production.
- As greater emphasis is placed on advanced fuels, production of biofuels will increasingly rely on technologies practiced by the chemical industry.

### ***Economics***

- The cost of feedstock is an impediment to the expanded use of biofuels.
- Chemical pretreatment processes that simplify hydrolysis on cellulose markedly improve the economics of fuel production.

### Technology roadmaps

ICCA is working closely with the International Energy Agency (IEA) as it is preparing technology roadmaps on climate issues.

### ICCA

The International Council of Chemical Associations (ICCA) is the world-wide voice of the chemical industry, representing chemical manufacturers and producers all over the world. It accounts for more than 75% of chemical manufacturing operations with a production exceeding USD 1,6 trillion annually. ICCA promotes and co-ordinates Responsible Care® and other voluntary chemical industry initiatives.

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## Catalysis Technology Roadmap:

- The chemical industry contributes to reductions in energy usage and GHG emissions by continuing to invent and deploy new catalyst technologies.
- More than 85% of chemical products are produced via catalytic processes.
- Newly developed catalysts allow processes to proceed via a lower energy pathway, which can allow process steps to be eliminated and streamline downstream processing, saving large quantities of energy and reducing GHG emissions.

### ***ICCA efforts to Develop Catalyst Technology Roadmap***

- ⇒ ICCA is working with IEA to show how catalysts can help meet CO<sub>2</sub> emission reduction goals.
- ⇒ The roadmap will show where catalysts can play a key role in chemical industry efforts to reduce energy consumption, enable adaptation to a changing feedstock mix, and allow production of unique advanced materials that help save energy for consumers.
- ⇒ The roadmap will examine the potential impact of improved catalysts across several development stages, deployment of the most effective technology, and identify hurdles and the best routes to lower these hurdles.

### ***Making Chemical Processes More Efficient***

- Catalysts play a key role in saving energy via improved selectivity and activity, which can reduce the energy and other resources needed for downstream processing.
- Improved routes to chemical intermediates that eliminate process steps and adapt to market needs (e.g., lower sulfur fuels, use of new fuels or feedstocks) can be enabled by catalysts.

### ***Catalyst Impact in Related Industrial Segments***

- Improved catalyst technologies in the chemical industry have leverage in other areas such as refinery, environmental, and waste treatment.
- Impacts in these areas relating to energy and GHGs are of particular interest in this work.

### ***Catalyst-Enabled New Materials***

- Catalyst innovations allow development of new materials used to make lighter-weight vehicles and aircraft, durable and light materials for wind turbines and solar panels, packaging, and adhesives for advanced materials.
- Advances in catalyst technology will be crucial to addressing the challenge of producing these materials from new monomers.

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## Building Energy Efficiency Technology Roadmap:

- The chemical industry contributes to a reduction in GHG emissions and improved energy efficiency in buildings through advanced component technologies.
- Significant improvements in GHG emission and energy efficiency, both for new construction and retrofits for existing buildings, can be achieved in the areas of insulation, windows and roofing.

### ***ICCA efforts to Develop Buildings Energy Efficiency Technology Roadmap:***

- ⇒ ICCA is working with IEA to develop a “Low Emission Buildings” roadmap to help meet CO<sub>2</sub> emission reduction goals.
- ⇒ The roadmap clarifies the importance of the chemical sector both in terms of R&D investments and core technology components.

## ***Building Technologies***

### ***Insulation***

- Whether spray polyurethane foam (SPF) in the attic or rigid foam polyiso board on the roof, polyurethane-based systems offer durability, energy savings and moisture control. When used in retrofit situations, they also help reduce building waste sent to landfills.
- In walls, behind walls and under floors, polystyrene foams provide significant energy efficiency. Savings vary by material and products: rigid extruded polystyrene (XPS) is a builder favorite because it can be installed easily and effectively; structural insulated panels made with expanded polystyrene (EPS) can help homeowners save hundreds of dollars annually on heating and cooling bills.

### ***Windows***

- Plastics rival traditional materials for window glazing. Clear, lightweight, shatter-resistant plastic products, such as polycarbonate used in windowpanes, have low thermal conductivity, which can help to reduce heating and cooling costs.
- Vinyl window frames are inherently energy efficient and save the U.S. nearly 2 trillion thermal units of energy per year, helping reduce GHG emissions associated with energy generation — all the while cutting maintenance time, materials and costs.

### ***Roofing***

- Reflective light-colored roofing membranes made of vinyl or thermoplastic olefin blends are key energy saving applications, especially for commercial buildings in warm climates.

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