

[Reference: Bayer direkt 1/2009]

Wind Turbines for Domestic Use Efficient Even in Light Breezes

Leverkusen. Tiny, extremely strong and ultra-lightweight *Baytubes* carbon nanotubes from Bayer offer excellent potential for wind energy. When incorporated into new plastics, they enable turbine rotor blades to be made longer and thus to generate even more electricity in large wind farms. They also help small wind turbines for houses and gardens to generate energy efficiently, even when the wind is not blowing particularly strongly.

Plastic rotor blades incorporating carbon nanotubes from Bayer MaterialScience (BMS) can be found, for example, in wind turbines manufactured by the Finnish company Eagle Windpower. *Baytubes* are many times stronger than steel but six times lighter. This has enabled the Finnish engineers to significantly reduce the weight of the rotors while at the same time making them more than 30 percent longer.

The turbines have such a fine structure that they start turning when the wind speed reaches a little over seven kilometers per hour – equivalent to a light breeze that you can just feel on your face. “And this means wind turbines are now even profitable for private use,” said Martin Schmid, who is responsible for developing the global *Baytubes* business at BMS. The Finns’ target customers for their wind turbines, which can achieve outputs of up to 20 kilowatts, also include small industrial companies, gas stations, farms, public buildings and leisure parks. Several thousand turbines are expected to be producing green electricity in northern Europe, America and Asia by the end of 2010.

The tiny carbon nanotubes offer great commercial potential. In around ten years’ time, the global market for these products is expected to be worth roughly two billion US dollars. That is why Bayer is currently building the world’s largest production facility for carbon nanotubes at its headquarters in Leverkusen (see box). “We are investing in a key future technology that is opening up a multitude of possible applications for us,” explained Dr. Wolfgang Plischke, the member of the Bayer Board of Management responsible for innovation, technology and the environment, at a press conference marking the start of construction work on the facility. According to Thomas Rachel, Parliamentary State Secretary at the Federal Ministry of Education and Research (BMBF), who also attended the press conference, “Carbon nanotubes have potential uses in many different applications, for example in improving fuel and battery technologies and making vehicles lighter.”

Safe handling of nanotubes – from manufacture and processing to utilization and recycling – is also assured. This is the subject of intensive research by Bayer and also by the BMBF’s neutral “Tracer” project. As a result, the prospects for this future technology are excellent. According to a study by the Global Wind Energy Council, the plants built in 2008 alone increased global wind power capacity by more than 30 percent.

Read more about Bayer’s activities for climate protection under:

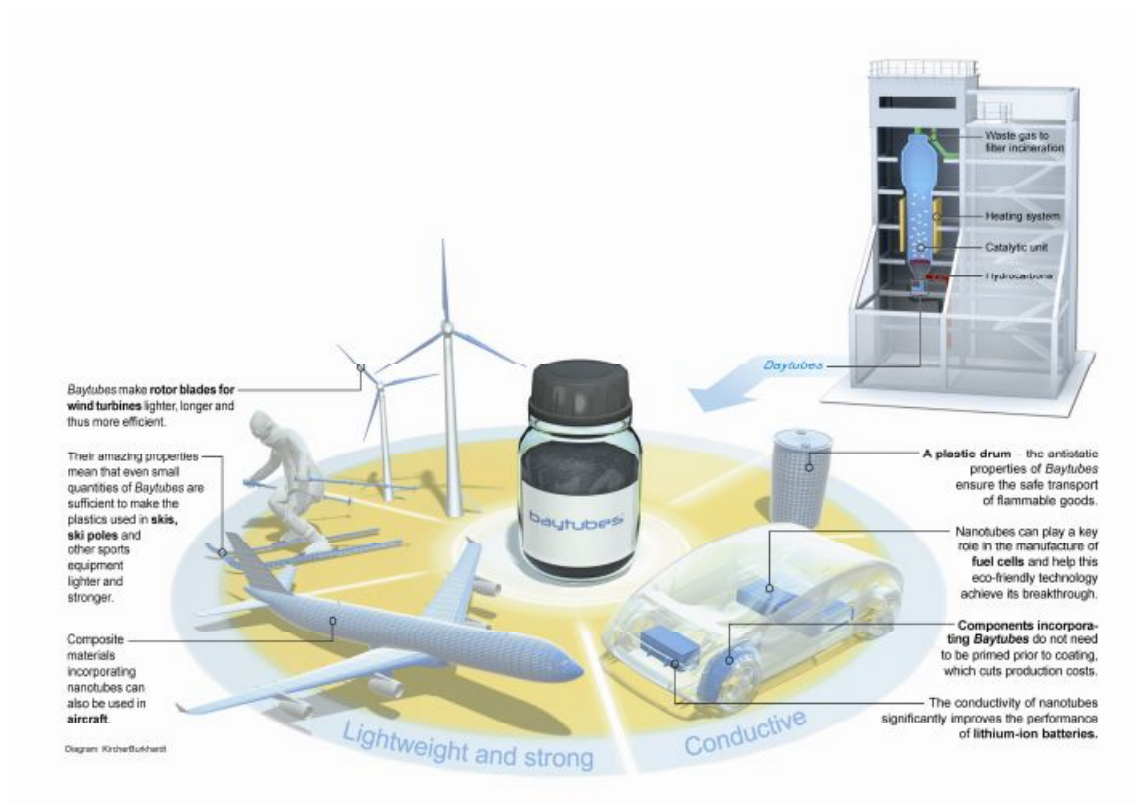
<http://climate.bayer-ag.com>

[Box 1]

Bayer invests EUR 22 million in Leverkusen

World's largest nanotube facility

Leverkusen. Bayer MaterialScience (BMS) is currently building the world's largest facility for the manufacture of carbon nanotubes at CHEMPARK Leverkusen. The new facility (see diagram) will have an annual capacity of 200 metric tons. The company is investing a total of EUR 22 million in planning, development and construction, and 20 new jobs will be created. "We are confident that the process offers a high-performance solution in terms of both technology and cost-effectiveness," said Dr. Wolfgang Plischke, member of the Bayer Board of Management. BMS is one of just three companies in the world with the capability to manufacture these microscopically small tubes on an industrial scale with consistently high quality. "Drawing on our expertise in polymer engineering, we can help our customers integrate Baytubes into various plastics," explained Martin Schmid, who is responsible for developing the global *Baytubes* business at BMS.



- *Waste gas to filter incineration*
- *Heating system*
- *Catalytic unit*
- *Hydrocarbons*
- *Baytubes*

Baytubes make rotor blades for wind turbines lighter, longer and thus more efficient. Their amazing properties mean that even small quantities of Baytubes are sufficient to make the plastics used in skis, ski poles and other sports equipment lighter and stronger. Composite materials incorporating nanotubes can also be used in aircraft.

The conductivity of nanotubes significantly improves the performance of lithium-ion batteries. Components incorporating Baytubes do not need to be primed prior to coating, which cuts production costs. Nanotubes can play a key role in the manufacture of fuel cells and help this eco-friendly technology achieve its breakthrough. A plastic drum – the antistatic properties of Baytubes ensure the safe transport of flammable goods.



Baytubes carbon nanotubes are ideal for state-of-the-art wind turbines like those at this gas station in Helsinki, Finland.



Dr. Wolfgang Plischke (left) and Thomas Rachel with a carbon nanotube model and sample.