

# sustainable material design

In the wake of global climate change, the demand for new sustainable products has dramatically increased. To meet this demand, many research activities at Innventia focus on inventing new materials and products made from cellulose and other renewable raw materials, such as by-products from the forest industry or gluten. These new materials are not only sustainable. They also provide new possibilities in function and design.



INNVENTIA



## Active materials

Innventia develops interactive paper and packaging materials that change colour and shape in response to various stimuli. These can, for example, be used to create smart packaging solutions.

Opto-active materials can change colour when they are exposed to specific stimuli such as moisture, temperature, tension or electricity. Marketing and product safety are two areas where a new technology using opto-active material is enjoying much interest. Mechano-active materials alter their shape in response to various stimuli.

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## Carbon fibres from wood

What if carbon fibres could be made of a renewable raw material instead of oil? What if this new raw material could be available in large quantities?

One research area of great industrial interest at Innventia is called *Biorefinery*. Here, new processes for turning by-products from pulp production into new valuable materials and fuels are being developed. One of these by-products is lignin, which has been shown to be a possible source for carbon fibres. With such a raw material as lignin, the price of carbon fibres could be lowered and the volume of production could increase considerably.

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The first **lignin fibre** intended for carbonisation was produced at Innventia in 2008.

## Eco Design – get it right from the beginning

To do the right thing from the beginning when designing, developing and choosing materials is an effective way of minimising the environmental impact and the costs. The most significant environmental aspects of a company are often its products. To focus on the products in the environmental work is in these cases, a pro-active and effective way for a company to decrease their overall environmental impact.

Eco Design is a work procedure for product development of new or modified products. The aim of Eco Design is to minimise the adverse environmental impacts from a product while the functionality or value of the product is retained or increased. In Eco Design the environment is given the same status as more traditional industrial benefits such as profit, functionality, aesthetics, image and overall quality. The concept of Eco Design includes the whole life cycle of products. Here the term product refers to both tangible and intangible products (services).

Innventia uses Eco Design principles such as eco-strategies when developing biocomposites.

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## Multi-client research creates platforms for developing new materials and products

The new paper pulp chair is an excellent example of research work carried out at Innventia and then turned into new innovative solutions. The fundamental idea of the material was developed in the research cluster New Fibres New Materials in the Cluster Research Programme, starting in 2003. Participating companies in this cluster were Södra Cell, Korsnäs, Billerud, Mondi, Hartmann, Stora Enso, M-real and BASF.

In the Cluster Research Programme, Innventia and its partner customers collaborate to solve problems in common and generate new possibilities. The results are further developed and then applied to create competitive advantages, e.g. products and processes, for the particular companies. Sharing the investment costs in R & D, the partners reduce their risks and benefit many times over from the investment.

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## A chair built on science

Parupu means pulp in Japanese. Parupu is also the name of a chair developed in a joint project between Innventia, the architectural office Claesson Koivisto Rune and Södra Cell, with support from VINNOVA. The purpose of the project was to produce a demonstrator to prove the usability and endless possibilities of a composite material based on pulp and PLA, a biodegradable plastic made from corn starch or sugarcane.

The demonstrator turned out to be a children's chair. The paper pulp chair is a light shell construction, produced from molded pulp (cellulose mixed with PLA-fibres) and hot pressed for final strength and finish. It is compostable, durable, stackable and water resistant, and will last a childhood.

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## Composites – the renewable materials of the future

Composites, i.e. fibre-reinforced plastics, represent the renewable materials of the future. They can be employed to advantage in a wide range of applications within the furniture, automotive, packaging and construction industries, among others.

Renewable composites offer more than just a way of replacing traditional, non-renewable materials. Their unique potential is expected to give rise to entirely new products and markets. An approach to design that extends to the molecular level makes it possible to produce composite materials that are perfectly adapted to market needs. Renewability, so far from being the defining factor, becomes one feature among many.



**The Kofes** in different colours, moulded from 60% unbleached kraft pulp fibres and 40% PLA. The material is fully renewable. The Kofes was exhibited at the 2007 Milan Furniture Fair. Design: Farvash Razavi and Nandi Nobell.

### The Kofes

In the marketing of these innovative materials, Innventia enlisted two prominent designers to create a sample, to be sent to design directors throughout the industry. The sample was not meant to define how the material should be used but to give a sense of its potential in connection with a specific production methodology, namely, fibre moulding.

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Pictures from the moulding process of the Södra Parupu chair in Markaryd, April 2009.

## Boosting business with science

Innventia is one of the world's leading R&D companies in the fields of pulp, paper, graphics media, packaging and biorefining.

Innventia is a trusted partner in R&D for innovations and new business opportunities, such as the development of new materials and products, or projects leading to more efficient processes or improved quality.

Innventia contributes to the productivity and profitability of its customers. Holding a unique position as the link between academia and industry, Innventia has the strength needed to turn promising ideas into real applications. All research is focused on user value.

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