ECO-SEE

Healthier, quieter and more energy efficient buildings

—

www.eco-see.eu

Source: University of Bath

ECO-SEE has developed hygrothermal coatings to passively regulate relative humidity levels, modified bio-based insulation materials to capture VOCs, and developed photocatalytic coatings to remove indoor organic pollutants using visible light sources.

The present booklet presents the outcomes of the ECO-SEE project which has received funding from the European Union. The views expressed in this booklet are those of the consortium and cannot be attributed in any way to the European Commission.

Written and edited by James Ling, Astrid Severin and Guillaume Corradino at Greenovate! Europe with contributions from consortium partners. Design by www.formasdopossivel.com. Printed on 100% recycled paper in Belgium.

Eco-materials for improved indoor environmental quality

PETE WALKER
Director of the BRE Centre for Innovative Construction Materials at the University of Bath, and coordinator of ECO-SEE

People spend up to 90% of their lives indoors, so it is perhaps not surprising that the quality of the environment created has a significant impact on their health and well-being. What is perhaps even more surprising is that the indoor air quality of some buildings, including modern low energy buildings, has been shown to be poorer than urban outdoor air quality.

Modern energy efficient buildings depend on increased insulation levels and greater air tightness to reduce heat losses or gains. Such buildings are often reliant on mechanical ventilation systems to maintain indoor environmental quality, however when these are not maintained correctly or used inappropriately by occupants this leads to problems with indoor environmental quality. In recognition of this problem the European Commission has supported a series of research projects developing eco-materials for improved indoor environmental quality.

The ECO-SEE project has developed hygrothermal coatings to passively regulate relative humidity levels, modified bio-based insulation materials to capture VOCs, and developed photocatalytic coatings to remove indoor organic pollutants using visible light sources. In addition the ECO-SEE project is using these materials to develop external and internal wall panels, and developing improved modelling capacity to support wider uptake of these solutions. This booklet presents the work of the ECO-SEE project.

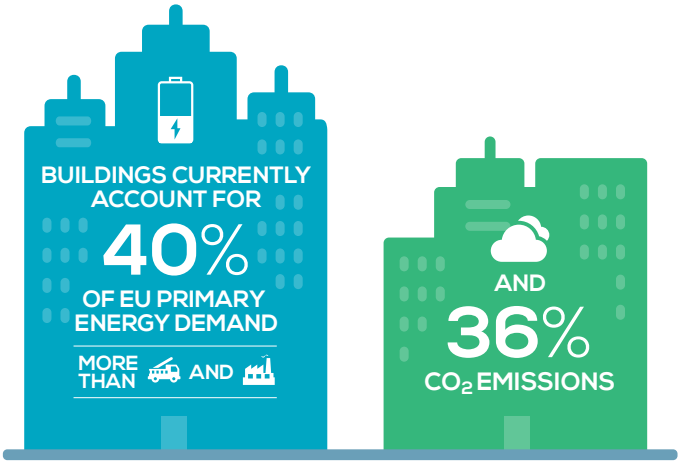
Innovation for a sustainable built environment

CHRISTIAN ARTELT
Chairman of the Materials & Sustainability Committee of the European Construction Technology Platform (ECTP)

Buildings are responsible for 40% of energy consumption and 36% of CO_2 emissions in the EU. As a result the construction sector is uniquely placed to help deliver Europe's energy goals and climate change obligations. We spoke with Christian Artelt, Chairman of the Materials & Sustainability Committee of the European Construction Technology Platform (ECTP) to hear about what action the sector is taking.

How is the construction sector helping to deliver Europe's energy goals?

The construction sector is working on developing and implementing solutions to reduce CO_2 emissions and energy consumption along the whole life cycle of buildings and infrastructures. This starts with the development of new building materials with reduced embodied energy and CO_2. The best available insulation techniques, highly efficient energy equipment and solutions, coupled with building automation, are of the highest relevance for reducing the energy demand during the usage phase. It is also important that energy consumption is monitored throughout the building's life to identify and implement improvement measures. When it comes to the end of life of buildings and infrastructures recycling is becoming more and more common practice. This helps closing the material loop and further reducing emissions and energy requirements related to the production of new building materials.



How will research, development and innovation (RDI) contribute?
The construction sector has enormously increased its RDI efforts over the past years and is developing numerous solutions to reduce its CO_2 footprint and energy consumption. Remaining within the goal of limiting global warming to less than 2°C as set forth in the Paris Agreement in fact requires innovative solutions going far beyond "business as usual". Research, development and innovation are therefore not only important – they are essential!

How important is it to ensure energy efficient buildings are also healthy?
As most of us spend 90% or more of our time in buildings it is very obvious that – besides being energy efficient – buildings also need to be "healthy" and ensure comfort and wellbeing. Indoor air quality, lighting, thermal and acoustical comfort are very important criteria to consider. Regarding indoor air quality, this also requires making well informed choices of construction materials used for ceilings, pavements and other applications.

Good for the planet, good for health

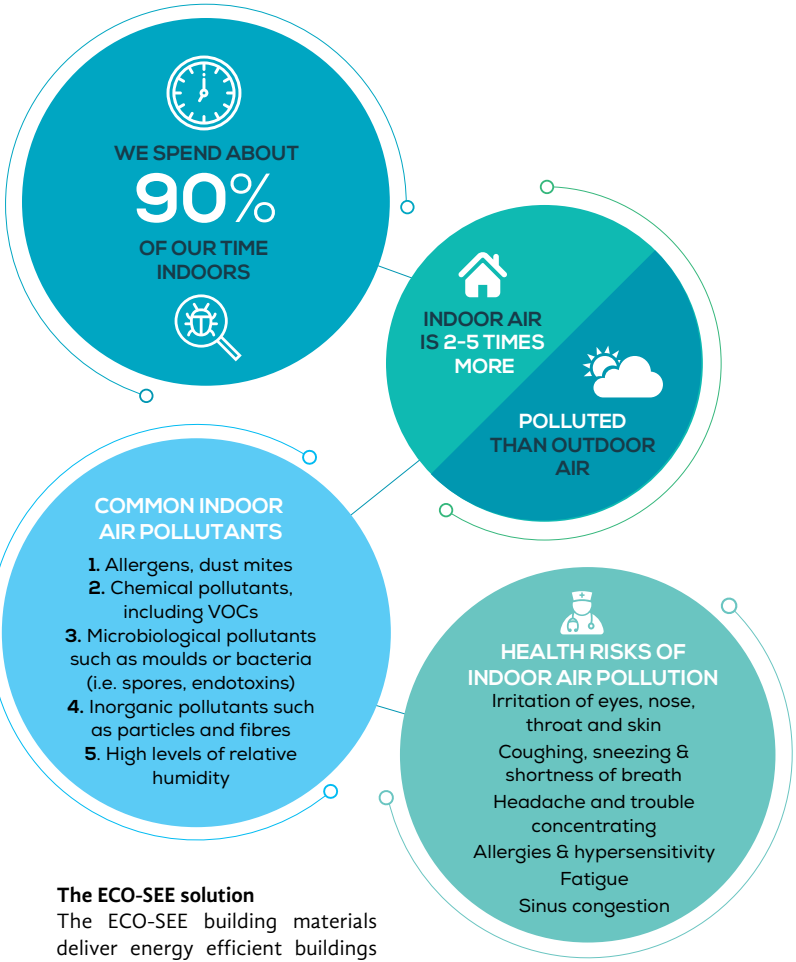
Improving the energy performance of buildings could significantly contribute to reducing our energy use and tackling climate change. This is why the EU has committed to 'put energy efficiency first' and created a binding EU-wide target of 30% for energy efficiency by 2030. As a result stricter laws regulate the energy performance of new and renovated buildings, requiring more air-tight construction combined with much higher insulation levels to create modern, low-carbon buildings. Air-tight buildings prevent heat escaping and thereby increase energy efficiency, but they can also create unexpected side effects.

The indoor air quality trade-off

Research has shown that reduced ventilation in air-tight indoor spaces leads to a build-up of harmful contaminants in the air, possibly having negative impacts on the health and well-being of occupants. Given the amount of time we spend indoors, in offices, homes, shops, etc., the quality of the air we breathe is critical to enable us to be productive and healthy.

Two basic factors contribute to indoor air quality: the volume of pollutants added by environmental factors and the degree of ventilation available. Some of the most common pollutants are volatile organic compounds (VOCs); chemicals released into the air by things like cleaning products, furniture, adhesives, carpets and paints. VOCs are suspected to contribute to 'sick building syndrome', causing headaches and depression and can act as an irritant to skin, eyes and the respiratory system.

Mould and bacteria are a result of excess humidity, which may arise from water leakages, condensation due to improper ventilation, or from ground moisture penetrating part of a building. Exposure to these pollutants are known to induce adverse health conditions, with respiratory problems being the most common symptom. Keeping relative humidity at a constant, moderate level – between 30 and 60% – can mitigate against negative health affects.



The ECO-SEE solution

The ECO-SEE building materials deliver energy efficient buildings and a healthy indoor environment. This is done through the removal of VOCs and regulation of humidity. At the same time thermal and acoustic comfort are increased, providing a healthier environment for building users.

The ECO-SEE approach: back to the future

ECO-SEE has developed novel eco-materials for insulation, coating and panel products. The new products are highly energy efficient and also improve the quality of the indoor environment. The project made use of natural materials, harnessing their in-built chemical and physical qualities, as well as conducting cutting edge research to exploit the latest nanotechnologies.

Bringing natural materials back to the mainstream

Natural building materials such as clay and timber have been used since time immemorial. Ancient buildings with clay can be visited all over the world such as in Ouarzazate, Morocco, with the oldest dating back to 10,000 BC. But in today's construction industry, natural materials are relatively niche, unable to compete with mass-produced concrete, steel and plastics.

ECO-SEE wants to bring natural materials back into mainstream use by showing how their unique qualities make them superior to their competitors, particularly for addressing

Ouarzazate, Morocco. Source: Astrid Severin

modern challenges of energy efficiency and indoor air quality. Project partners carried out a full scientific characterisation of the VOC capture and humidity regulation potential of a range of eco-materials to provide the basis for product development. A short list of 21 different materials was made, from which the most promising were selected for further development during the project.

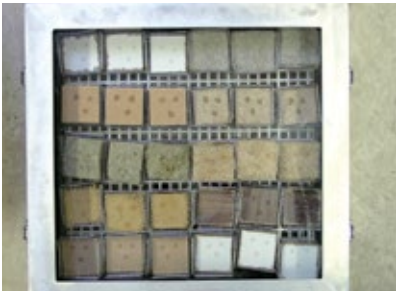
Integrating state-of-the-art nanotechnology

As well as looking to nature, ECO-SEE has also furthered the latest developments in nanotechnology to maximise the impact of its eco-materials. Nanotechnologies are poised for widespread use in the construction industry, where they can enhance many materials, making them harder, lighter or more durable. ECO-SEE partners have used this technology to develop photocatalytic products that are able to 'clean' air, significantly improving indoor air quality.

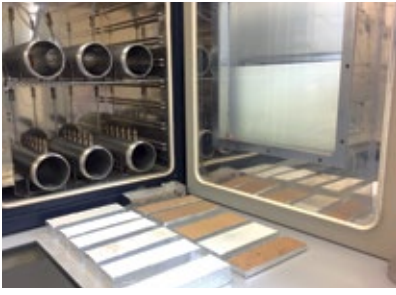
The two approaches have resulted in a number of new eco-building materials being developed during the project, falling into three product groups: insulation, coatings and panels.

Novel eco-building materials

Many of the innovative eco-materials developed during the project have been integrated into the ECO-SEE wall panels. The internal partition panel and highly insulated external panels represent the state of the art for building materials that improve the indoor environment. They deliver lower embodied energy, enhanced durability and lower costs compared to current market solutions, as well as reducing post-build costs to remedy poor indoor environments.



Source: Fraunhofer IBP



Source: University of Bath/BRE

Natural materials

ECO-SEE has harnessed the power of nature and the unique characteristics of natural materials to develop new products capable of significantly improving indoor air quality.

The surprising qualities of natural materials

ECO-SEE partners have worked to advance the state-of-the-art in bio-based construction materials: those derived from materials of biological origin. Though they only represent a small share of the overall market for building materials, they possess a number of advantages over traditional products.

Better for the outdoor environment...
Building with natural materials can significantly reduce carbon emissions. The total energy required for the extraction, processing, manufacture and delivery of bio-based materials is generally very low. On top of this, bio-based materials have the ability to store carbon, meaning buildings can be carbon neutral, or even carbon negative.
The use of rapidly renewable materials - many of which are residues or by-products - also helps prevent the depletion of the planet's resources. At the end of their life non-toxic bio-materials can safely be disposed of, or, more often, recycled.

...the indoor environment...
Bio-based materials also have some unique characteristics that make them excellent building materials, and especially promising for improving indoor conditions.
Some eco-materials are hygrothermal, meaning they naturally absorb and release moisture and heat. This has the effect of regulating indoor temperature and humidity, keeping them within a healthy and comfortable range for occupants.
Eco-materials also have the ability to absorb harmful gases. Natural fibres permanently absorb and break down pollutants such as volatile organic compounds (VOCs), significantly improving indoor air quality.

...and the wallet?
It is a commonly held belief that bio-based products are 'nice to have', but will remain a niche as they are not competitive pricewise. But over a lifetime, bio-based materials can reduce post-build costs to remedy poor indoor environments, and save users money on their heating bills. Not to mention the external savings to society from using renewable and low carbon materials.

1 **Clay and cork**
Source: University of Bath

2 **Sheep's wool**
Source: University of Bath

3 **Hemp fibre**
Source: University of Bath

4 **Timber**
Source: Kronospan

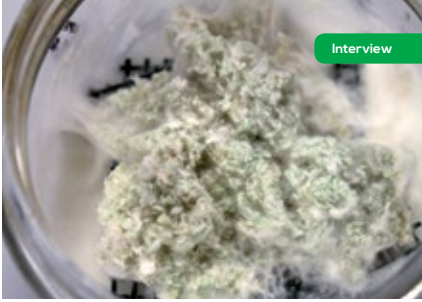
Enhancing natural insulation

DR GRAHAM ORMONDROYD
Bangor University

The market for more environmentally-friendly bio-based alternatives is growing. Natural insulation – for example from recycled paper, hemp or wool – can already compete with artificial solutions in terms of thermal and acoustic performance. But certain inherent characteristics mean that these materials can offer advantages over their competitors. Dr. Graham Ormondroyd from Bangor University explains his research into sheep's wool insulation within the framework of ECO-SEE.

What makes sheep's wool such a unique and interesting insulation material?
Well, first of all, sheep's wool is known to have very good thermal insulating properties. What really interests us, however, is that sheep's wool has an inherent ability to absorb volatile organic compounds (VOCs) and improve indoor air quality.

How does the absorption work?
Sheep's wool stands out from other fibres utilised by the natural insulation industry as being the only protein-based fibre, the others being derived from cellulose rich materials. Natural proteins are composed of a number of amino acids which react with gases such as formaldehydes, other VOCs, nitrogen oxides and sulphur dioxide. This reaction has the effect of 'absorbing' the harmful gases.



Source: Bangor University

Source: Bangor University

What have you been doing in ECO-SEE to develop this further?

The main aim of our work has been to develop treatments to increase the VOC absorption potential of wool. We have tested a range of possible modifications and treatments covering mechanical, chemical, additive and energetic/irradiation methods. The work is challenging mainly due to the chemical variability of the different gases and their typical low concentrations. The capacity for wool to absorb VOCs was also found to vary between sheep breeds.

What are the results of your investigations?

We found a lot of potential in chemical modifications and additives. Our research showed that certain additives are able to increase the ability of wool to absorb formaldehyde gas by over 100%. Based on this we were able to recommend a combination of treatments for use in the prototype insulation, which was integrated into the ECO-SEE wall panels.

Breakthrough panel products

The most effective way to keep indoor air clean is to prevent pollutants entering a building in the first place. For this reason, strict international standards have been introduced to regulate products' VOC emissions. Among building materials, a common source of VOCs is interior panel products, normally made from woodchip or medium-density fibreboard (MDF). The development of low-VOC panel products is a necessary pursuit, both for the purpose of improving indoor air quality, and to comply with legislation.

Within ECO-SEE the Wood Technology Institute (ITD) in Poland took up the challenge to produce a low-VOC woodchip panel.

Material testing and selection
ITD first characterised the different chips and adhesive resins available for panel production, ascertaining their different physical qualities, as well as formaldehyde and VOC content and emissions.

After testing 90 different panels at labaratory scale, the best combination of chips and adhesive was identified.

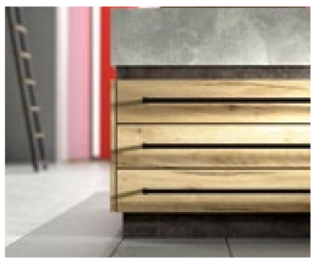
Breakthrough product
The results have shown the possibility of producing chipboards that can significantly improve indoor air quality by reducing pollution from formaldehyde and VOCs.

The developed panel also has the beneficial mechanical properties of regular wood based products, complying with all applicable standards.

The final board has only 50% of the allowed formaldehyde content and emissions, and a safe VOC level.

Source: Kronospan

Source: Kronospan



Making walls breathe

Excess moisture in a building can lead to damp and mould, causing problems for indoor air quality and health. One way to maintain safe levels of humidity is to use natural building materials. Many such materials are hygrothermal and vapour permeable (or 'breathable'); they naturally absorb and release moisture and heat, passively regulating humidity and temperature. Clay is one such material. It is often used as an internal base and finishing plaster, meaning it covers a large surface area which is in direct contact with the indoor climate. There is therefore significant potential to utilise this exposed wall surface area for the passive regulation of the indoor environment.

Novel clay plasters

ECO-SEE partners aimed to maximise this potential by developing novel clay plasters with enhanced moisture buffering properties. Different mixes were tested, incorporating a range of bio-based additives and natural mineral aggregates.

The novel clay plaster selected for further development is a ready-to-use mixture. It is an undercoat for use below a fine coloured clay finish. The plaster incorporates straw fibres which are known to contribute to humidity regulation. Unusually, it also made without sand – an increasingly scarce resource. Instead natural pumice and untreated brick powder was used.

Testing of the plaster has already moved up to demo scale. ECO-SEE test cells in the UK and Spain were erected by the University of Bath and ACCIONA for long term measurements. Inside the test cells Claytec and Black Mountain Insulation (BMI) installed a liner system: Claytec's base coat clay plaster being applied upon BMI´s Magnesium Oxide board (MgO board).

New testing methods

Though the hygrothermal properties of natural materials are well known, they are not so well understood. During the testing, a method for quantifying the moisture buffering properties of materials was also

Source: Claytec

Laboratory testing has shown that the novel product has an excellent moisture buffering value, and that it also reduces VOC emissions.

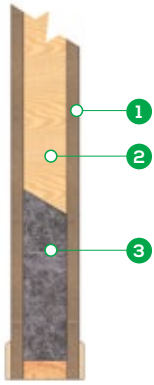
Source: Claytec

developed. Previous methods were typically quoted with respect to surface area only, but this new method also takes into account the effect that depth has on the moisture buffering. The significance of directly measuring the moisture buffering penetration depth will contribute towards optimising material use for improved indoor air quality.

The ECO-SEE wall panels

Two ECO-SEE panel products have been developed, incorporating the innovative eco-materials developed during the project. The panels have been designed by partner ModCell, who specialise in the manufacture and erection of low carbon, prefabricated building panels. The panels have adopted a timber structural frame to allow flexibility in choosing which ECO-SEE materials are used for a particular application.

VERTICAL SECTION



INTERNAL

1. ECO-SEE wall liner

There are three liner finishes; Photocatalytic Lime, Clay, Photocatalytic Timber Boards.

2. ECO-SEE internal panel timber frame

The panel is made up of a softwood timber frame. In new buildings internal panels may be prefabricated as either open or closed elements. For installations in both new and retrofit projects the final finish will be installed in-situ once the building is weather tight and risk of surface damage is low.

3. ECO-SEE insulation

The internal panels use enhanced Sheep's Wool insulation for acoustic separation. This inner blanket helps to buffer humidity and to degrade VOCs, which permeate through the vapourpermeable liners.

PLAN SECTION

EXTERNAL

1. ECO-SEE wall liner

There are three liner finishes; Photocatalytic Lime, Clay, Photocatalytic Timber Boards.

2. ECO-SEE external panel timber frame

The timber frame is made up of two sections; an outer chamber formed with timber I-Joists and an inner chamber. The two are separated with an OSB diaphragm which controls water vapour movement into the colder outer chamber while still allowing the moisture buffering properties of the inner insulation to be coupled with the internal environment.

3. Outer layer of ECO-SEE insulation

Uses either factory installed hemp fibre or Nesocell cellulose, which is blown in on-site.

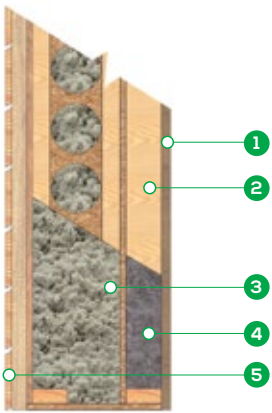
4. Inner layer of ECO-SEE insulation

Uses enhanced Sheep's Wool insulation. This inner blanket helps to buffer humidity and to degrade VOCs, which permeate through the vapour permeable internal liner.

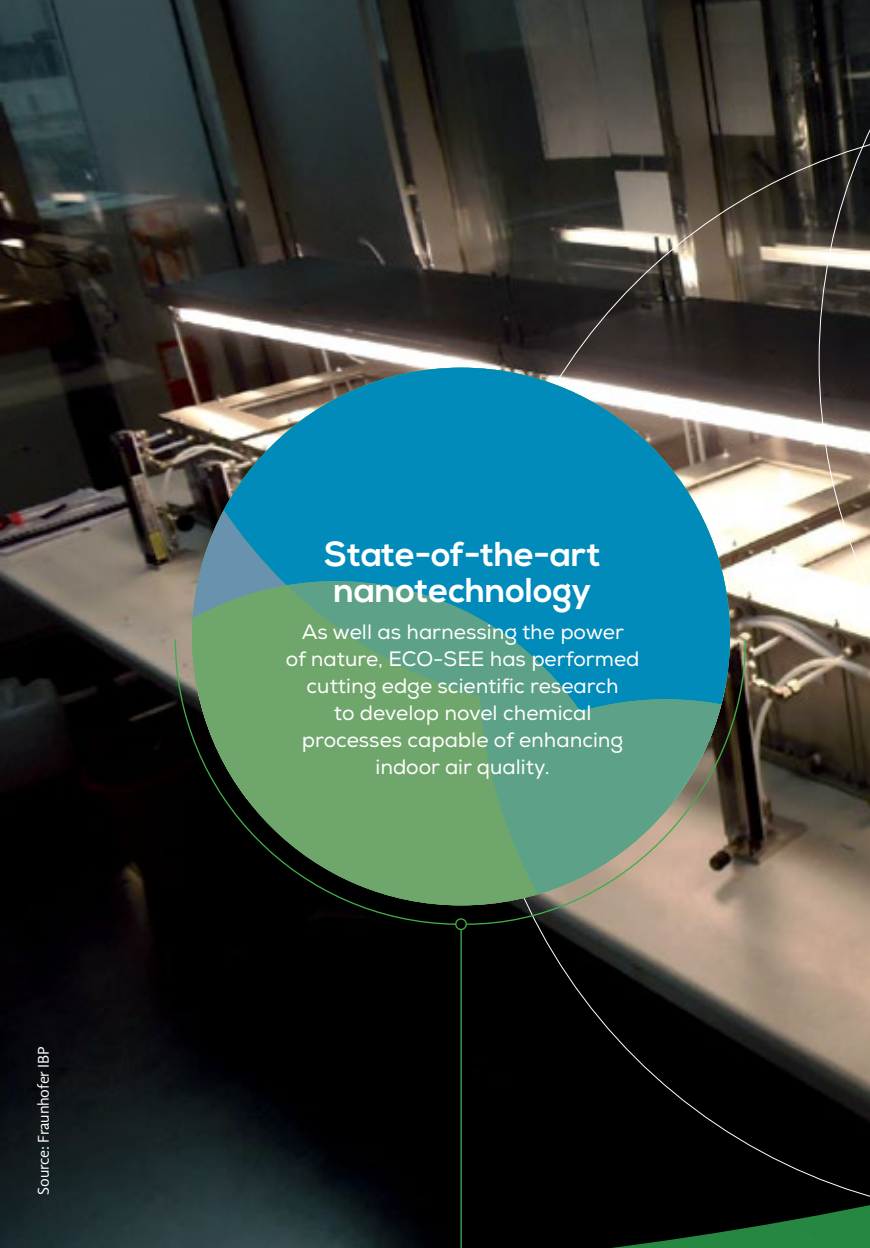
5. External cladding

Provides weather protection to the external ECO-SEE panels. Cedar cladding is shown but a wide range of materials and finishes can be used.

VERTICAL SECTION



PLAN SECTION



State-of-the-art nanotechnology

As well as harnessing the power of nature, ECO-SEE has performed cutting edge scientific research to develop novel chemical processes capable of enhancing indoor air quality.

Source: Fraunhofer IBP

Let there be light

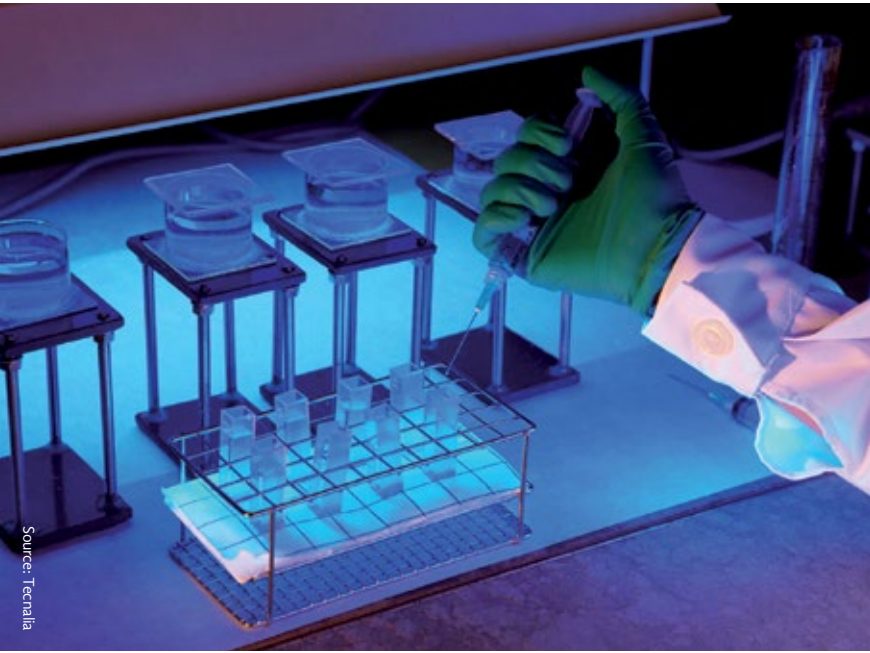
JOÃO LABRINCHA
University of Aveiro

Light is an amazing source of energy – the power behind virtually everything that happens on Earth. But recent developments have shown how it can also be used for keeping things clean. We spoke with João Labrincha from the University of Aveiro to find out more about photocatalysis, including how it can help improve indoor air quality.

So what exactly is photocatalysis?
Photocatalysis describes a chemical reaction which is accelerated by light. It requires the presence of a photocatalyst, which causes the reaction without itself being involved, consumed or undergoing any changes. The most commonly used photocatalyst is Titanium Dioxide (TiO_2). There has been a large upswing in research and development related to these technologies, and we are seeing their use grow.

Why is this interesting for use in buildings?
TiO_2 is already used for 'self-cleaning' walls or windows. This works because the TiO_2 nanoparticles oxidise organic material: turning dirt into water and carbon dioxide. As well as walls and windows, however, this technology can also be used to clean air: turning harmful chemicals and gases into harmless ones. Therefore if photocatalysts can be integrated into internal surfaces they could have a significant impact on indoor environment quality.

What have you been doing within the ECO-SEE project?
One factor which is holding back this technology is its low efficiency in indoor conditions – it needs UV light (such as from the sun) in order to work. To remedy this we have been working to increase its effectiveness



Source: Tecnalia

under artificial light. This has involved modifying the TiO_2 nanoparticles. Silver was chosen as a modifying agent on the basis of both a literature review, and previous experiences of ECO-SEE project partners.

The new Ag-TiO_2 we have developed has shown itself to be an excellent photocatalyst, harvesting visible artificial light. It also proved to be a multifunctional material, possessing antibacterial and photochromic properties, and having photocatalytic properties very similar to, or better than, commercially available alternatives.

What plans do you have to develop this further?

The large number of publications we have made in high impact journals reflects the growing interest in photocatalytic solutions. While further research and development is needed, we are sure that the use of photocatalysis in construction is going to be a growing trend in the coming years.

Photocatalytic building materials

Photocatalysis has been shown to have great potential to improve the indoor environment by removing harmful pollutants like VOCs. But how can this potential be realised? ECO-SEE partners have been on the case, developing photocatalytic building solutions for indoor use.

Lime mortar coatings

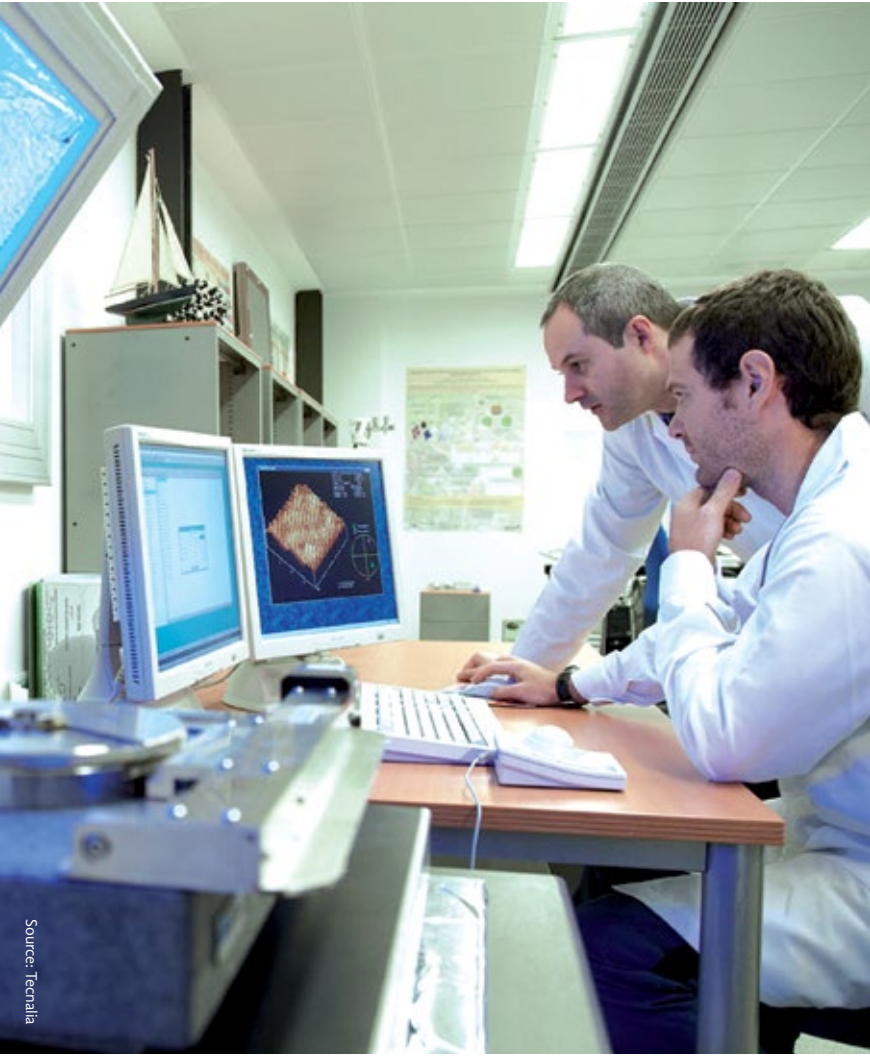
Decorative finishing plasters can have a big impact on air quality due to the large surface area which is in contact with the indoor environment. To exploit this, lime mortar coatings with photocatalytic properties have been developed by Tecnalia, in cooperation with BCB Lhoist.

A novel product has been developed by adding a small quantity of photocatalytic titanium dioxide nanoparticles to one of BCB's existing mixtures. The result is an enhanced product which has been shown to have a significant VOC reducing effect, being especially effective against formaldehyde. The new coating loses none of its previous functionality, and appears identical to the standard product: neither texture nor colour changes are visible to the naked eye.

Wood panel coatings

Photocatalytic coatings for wood panels were also developed during the project, as part of a collaboration between the University of Bath and Kronospan Ltd. Kronospan manufactures decor finishes from paper, which are applied to its medium density fibreboard (MDF) panel products.

A very fine photocatalytic coating was developed by the University of Bath, suitable for using with the decor finish. Photocatalytic nanoparticles were mixed into a liquid solution which was applied onto the decor finish. The coating was optimised to ensure good adhesion to the decor finish, as well as good dispersion of the nanoparticles. Testing has demonstrated the feasibility of producing commercial MDF panels finished with active photocatalytic coatings.



Source: Tecnalia

Choosing the right eco-materials

SEBASTIAN STRATBÜCKER
Fraunhofer IBP

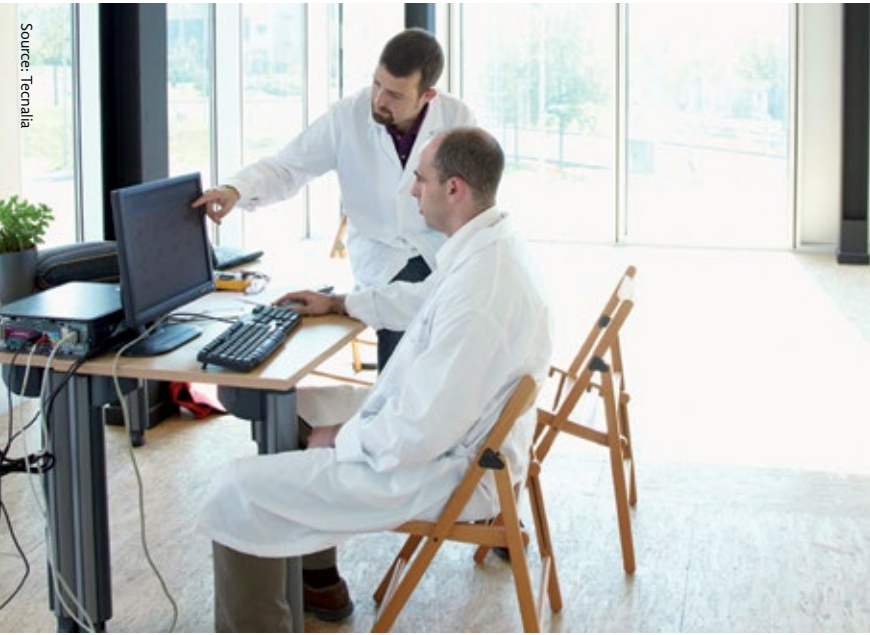
With so many novel eco-materials being developed during the ECO-SEE project, which should you choose for your construction project? Project partners have created a tool to provide the answer. Sebastian Stratbücker from Fraunhofer IBP gives more detail about the ECO-SEE holistic design tool.

What is the idea behind the tool?
The tool will assess the potential impact different materials have on indoor environment quality. This will enable the comparison of different products, helping people make more informed decisions about their use of materials. By providing this kind of performance data within the tool, we can help substantiate the advantages offered by eco-materials such as those developed by ECO-SEE.

Which indoor environmental aspects does the tool consider?
The tool provides a holistic product evaluation based on simulation modelling and reference cases. It aggregates three different parameters: heat and moisture transfer effects; indoor air flow and quality; and acoustic performance.

At Fraunhofer we have led the heat and moisture modelling. First, thanks to the enhancement of our WUFI® Plus simulation tool, we can now understand better than ever the moisture buffering behaviour of different materials. Additionally, following our testing of many eco-materials during ECO-SEE, we are now able to accurately predict and evaluate the risk of mould growth.

The air quality modelling capability has been enhanced by partners at the Indian


Source: Tecnalia

Institute of Technology Delhi (IITD). Using partners' data on the VOC and Formaldehyde adsorption capacities of different eco-materials, IITD developed and validated an air quality simulation model. This model can be used for other materials and VOCs.

BRE have led the development of the acoustic model. They used the acoustic and physical properties of the ECO-SEE materials, as well as of typical panel designs, as inputs for their model. The resulting model can assess materials in terms of their impact on sound insulation between adjacent spaces, noise within a building and the control of reverberation.

Who is the tool aimed at?

Architects and building designers responsible for product and material selection – both for new builds and refurbishments – will find the tool useful. We have reduced the complexity of the user front-end and we also support Building Information Modeling (BIM) tools to make the software as intuitive as possible with these users in mind.

Performance testing

The ECO-SEE panel prototypes have been tested at full-scale to validate their design and performance. Two cells of 30m³ were constructed at the ACCIONA demopark site in Spain and the University of Bath's HIVE test facility in the UK to test the panels in two quite different climatic conditions.

Source: Acciona

Source: Acciona

The ECO-SEE test cells in the UK and Spain are identical, both being constructed in the same way. For each demonstration the ECO-SEE wall panels were largely manufactured offsite. They were then transported by truck to the site and moved into place with a crane. Once in position, a second insulation layer was inserted and lined with MgO wallboards. A clay plaster was then applied, and reworked to achieve a smooth finish.

Monitoring real life conditions

The cells will be monitored to evaluate indoor air quality as well as acoustic, microbial and thermal performance in real weather conditions.

First results have shown that the concentration of VOCs is lower in the ECO-SEE cells compared to the traditional reference units, coming in well below World Health Organisation limits.

Source: University of Bath

Source: University of Bath

Source: University of Bath

Eco-materials in the real world

Creating healthy offices...

Photocatalytic panels developed by ECO-SEE are already improving air quality in at least one building in the UK: the head office of Skanska.

The ECO-SEE partner was keen to take materials out of the laboratory and test facilities and into a real office environment.

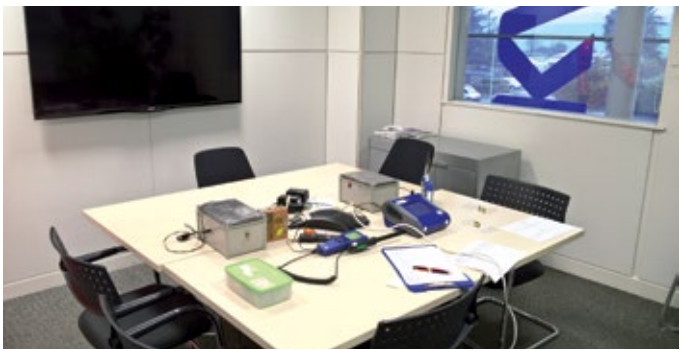
Kronospan panels were installed around the walls of a meeting room in Skanska's Maple Cross office, and treated on-site with a photocatalytic coating. The meeting room is already in use, and will be monitored throughout the duration of the pilot. Air samples are being taken by BRE and will be compared with the adjacent 'control' room.

...and schools

Building with pre-fabricated panels such as those developed by ECO-SEE is already well established, helping to deliver the next generation of eco-friendly buildings.

One of the latest projects from ECO-SEE partner ModCell is to build a new school on the Isle of Anglesey. The prefabricated panel systems developed by ModCell provide a useful precedent and reference for the ECO-SEE panels, and informed the design of the ECO-SEE prototypes.

Source: Skanska



Source: ModCell

Source: ModCell

Breakthrough eco-building solutions

DARREN HILL
C-Tech Innovation

C-Tech innovation are experts in eco-innovation and business strategy. Within ECO-SEE they worked with all partners to develop an exploitation strategy and define business models for the key project results, to support commercialisation and market take-up. Here the key results are presented by Darren Hill, who explains the distinct benefits of the new and enhanced ECO-SEE eco-building solutions.

ECO-SEE WALL PANELS

ECO-SEE Interior wall panel

- A tailored, bespoke and customisable interior partitioning system.
- Improved value versus standard panels in terms of air quality improvement, as well as moisture control, noise, and mechanical functions. Backed by in-depth technical performance data.
- A prefabricated product that is easy to fit and maintain, with strong aesthetic values.
- Benefits occur passively meaning minimal intervention required.

For more information contact:
University of Bath

ECO-SEE Exterior wall panel

- Enhanced indoor environmental quality (IEQ) and thermal performance, as well as strong moisture, noise, and mechanical functions. Backed by in-depth technical performance data.
- Manufactured from renewable and natural materials, resulting in lower embodied energy.
- Prefabricated, making installation easy and fast.

For more information contact:
University of Bath

PANEL PRODUCTS

Photocatalytic Panels

- Panel products with superior air quality maintenance through photocatalytic action on VOCs and/or microbial contaminants.
- All the desirable mechanical properties of melamine coated MDF or other similar wood-based panels.
- Low carbon impact product and life-time performance – no saturation.

For more information contact:
Kronospan Ltd.

Low VOC Panels

- No added VOCs as well as use of scavengers significantly improve air quality.
- Comparable mechanical properties to wood based products.
- Supports end-users to meet increasingly tight regulations on VOC emissions.
- Natural, renewable and water resistant.

For more information contact:
Wood Technology Institute (ITD)

Breakthrough eco-building solutions

INSULATION

Insulation products with enhanced VOC capture

Natural materials with reduced carbon footprint and low embodied energy. Non toxic and recyclable.

Hemp

- Hemp fibre insulation with excellent thermal properties.
- Robust and structurally rigid product with capacity to buffer moisture and regulate thermal performance.

For more information contact:
Black Mountain Insulation

Sheep's wool

- Enhanced product with the capacity to absorb and degrade indoor pollutants.
- Absorbs, stores and releases moisture fast, helping to regulate humidity.

For more information contact:
Black Mountain Insulation

Nesocell

- Loose fill insulation made from by-product of the paper industry.
- Modification can enhance its capacity to buffer moisture and indoor pollutants.

For more information contact:
Nesocell

COATINGS

Lime coating products

- Enhanced product with photocatalytic properties proven to significantly reduce VOCs.
- Identical to standard product in terms of functionality, texture and colour.

For more information contact:
BCB Lhoist

Clay coating products

- Novel plaster incorporating straw fibres.
- Excellent moisture buffering value, and VOC emission reduction.
- Ready-to-use mixture.

For more information contact:
Claytec

DESIGN

Design Tools for Holistic Indoor Air Quality

- Predictive tool to support the decision making process and material selection in the building design/planning phase.
- Supports easy to use Building Information Modelling (BIM) tools.
- Quantification of IEQ effects of building materials, validated against real world data.

For more information contact:
Fraunhofer IBP

Consortium

The consortium brings together a multi-disciplinary team of researchers from universities and research organisations with a number of large enterprises and innovative SMEs whose combined expertise and capacity will lead the commercial development and exploitation of the products.

University of Bath › UK
www.bath.ac.uk

ACCIONA Construcción › ES
www.acciona-construccion.com

University of Aveiro › PT
www.ua.pt

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BCB Lhoist› FR
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ModCell › UK
www.modcell.com

Fraunhofer IBP › DE
www.ibp.fraunhofer.de

Greenovate! Europe › BE
www.greenovate-europe.eu

Indian Institute of Technology Delhi (IITD) › IN
www.iitd.ac.in

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www.nesocell.com

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www.skanska.com

TECNALIA › ES
www.tecnalia.com

Wood Technology Institute (ITD) › PL
www.itd.poznan.pl

Kronospan › UK
www.kronospan-worldwide.com

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50%
improvement in energy performance[1]

20%
improvement in material performance[2]

20%
reduction in embodied energy[3]

ECO-SEE

Breakthrough eco-building solutions

www.eco-see.eu

1 external wall elements compared to reference
2 compared to existing solutions 3 compared to reference

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