

## Reference projects (2008-2011)

### **Color effects in bi-component fibres**

The main goal is the development of a bi-component fibre with a blend of 2 different polymers mixed with 2 different dyestuff (and therefore colours).

### **Fibres development and processing using high temperature polymers**

Using the Pilot Bi/Tricomponent melt spinning, polymers with working conditions up to 450°C, are being developed and processed into textile fibres.

### **Coating of textile substrates by means of innovative technology and use of nanomaterials**

The main objective is to develop advanced polymeric coatings, with resource to technology more efficient than the conventional methods - from the material, energy and environment points of view.

### **Advanced materials with enhanced thermal insulation and low gas permeability**

The main goal is to develop innovative materials with high thermal insulation and low gas permeability, using coating technologies with resource to nanotechnology. Several formulations of nanomaterials will be developed and tested as well as their inclusion in polymeric matrixes.

### **Functional materials for diseases prevention**

The main objective is to develop materials, through innovative nanocoatings technologies, with optimized properties regarding hydrophilicity, resistance to bacteria and fungi. The major challenge is to make in a way which is completely biocompatible and harmless.

### **A new process for bleaching fibres of animal origin**

The idea of this project is to establish a new process for bleaching textile substrates. With the innovative technology proposed it is possible to increase the whiteness index of fibres of animal origin, with important reductions in the consumption of whitening agents and other auxiliary compounds, as well in the water and energy demand.

### **Coating of flexible substrates by means of innovative coating technology**

The main objective is to develop advanced polymeric coatings, with resource to technology more efficient than the conventional methods, in order to enhance consumer products grip resistance.

### **Products development with easy cleaning and dirt repellency**

The main goals are the development of an innovative set of products, easy to clean and with good water/dirt repellent capability

### **Coating of inorganic materials with metal oxides for self-cleaning and agent release functionalities**

The main objective is to develop advanced nanoparticle coatings, to coat inorganic materials by sol-gel techniques, in order to obtain self-cleaning and agent release functionalities.

**Improvement of inorganic material's mechanical properties**

The main goal is to develop materials with advanced mechanical properties by incorporating nanostructured materials

**Fabrics releasing active principles**

Development of a system to progressively release active principles, with high washing fasteness.

**Flame retardant textiles**

Development of solutions to flame retardancy, base on novel fibres and coatings.

**New bases for digital printing improvement**

Formulation of polyolefin coatings for digital printing improvement.

**Set-up and application of photovoltaics cells in automotive and aeronautic structures**

System and set-up development for the application of flexible photovoltaics cells (plus all generation and storage energy systems) in structures with relevance for automotive and aeronautic vehicles.

**Photo and electroluminescent inorganic materials**

Development of multilayer devices based on OLEDs (Organic Light Emitting Diodes), electroluminescent and photoluminescent materials.

**Electrochromic devices in metallic surfaces**

Development of materials and multilayer devices with electrochromic characteristics.

**Incorporation of sensors-actuators systems onto apparel products**

The main goals are the development of an innovative apparel set of products, with sensing and actuation capabilities in order to improve users quality of life.

**Deposition of sensors/actuators on inorganic substrates**

The main goal is the development of materials with sensing/actuation properties through the deposition of piezoelectric materials.

**Lighting parasol with clean energy use**

Development of a system in a parasol to produce clean energy to charge LEDs lights automatically.

**Home textiles products with lighting and clean energy generation**

Development of a system in home textile products to produce clean energy to charge LEDs lights automatically.

#### **PV Thin film Measuring set-up**

The goal of this project is to develop an experimental setup that will allow thin films and solar cells characterization. This work is coordinated by João Pedro Alpuim (Physics department of Minho University).

#### **Thin-films in fibrous substrates**

Deposition of ITO and IZO in fibrous substrates.

#### **Intelligent fireman jacket**

Development of a sensing/actuating system in a fireman jacket, to detection of carbon monoxide.

#### **Lighting fashion apparels**

Development of a lighting system based on LED technology and its integration on fashion apparels.

#### **Characterisation of the thermal performance of electrical heating products**

This project involved the characterisation of the thermal performance of electrical heating products (gloves and footwear). Specific test procedures were designed to inform on the effect of the smart features (i.e. heating capacity and temperature control).

#### **Analysis of the thermal performance of thermal bags**

Within this project, an experimental procedure was developed to characterise the thermal performance of thermal bags, used for food transport. Climate chambers and multi-sensor data loggers were used for this purpose. The obtained information is relevant for the verification of product requirements compliance.

#### **Characterisation of PCM-enhanced consumer products**

This project involved the evaluation of the thermal performance of footwear products enhanced with Phase Change Materials (PCM). Several technologies were used, e.g. climate chamber, thermal foot manikin, infrared camera and multi-sensor data loggers.

#### **In-shoe microclimate monitoring**

Within this project, experimental procedures were developed to monitor, in a non-intrusive way, the temperature and humidity inside a shoe, during day-to-day activities. Multi-sensor portable data loggers were used to acquire in-shoe microclimate data during several wear-trials.

#### **Characterisation of the thermal performance of clothing items**

This project involved the development and implementation of manikin-based test methods for the characterisation of clothing thermal performance. Several parameters were analysed, e.g. thermal resistance, evaporative resistance and moisture management.

### **Analysis of the ventilation performance of bed nets**

This project involved the characterisation of the ventilation performance of different bed nets through the use of thermal manikins and climate chambers.

### **Characterisation of the optical properties of materials**

In this project, experimental procedures were implemented according to standardised protocols, to measure the total hemispherical emissivity of materials. Specific test procedures were considered, according to the characteristics of the materials to test (e.g. textiles, leather, laminates, plastics, etc.).

### **Characterisation of the moisture management of footwear**

In this project, an experimental (wear-trial-based) procedure was developed to assess the performance of different types of footwear (or footwear components, e.g. insoles) regarding moisture management. Several phenomena were studied, which resulted in a set of indexes characterising the ability of the footwear to absorb, transfer and evaporate sweat.

### **Analysis of buildings energy efficiency**

Within this project, energy analyses were developed to inform about the effect of materials and products on buildings energy efficiency and associated thermal environment. This produced detailed information about the thermal impact of materials and products in real building structures.

### **Optimisation of a wind tunnel by numerical simulation (CFD)**

This project involved the use of numerical simulation approaches (CFD - computational fluid dynamics) to optimise the geometry of a wind tunnel, to be used inside the existent climate chambers (e.g. for evaluation of clothing thermal performances in windy scenarios). This project addressed the effect of the test zone position, dimension and shape, together with the effect of the fan enclosure, position and operating curve.

### **Optimisation of an electrical heating glove by numerical simulation (CFD)**

This project involved the numerical study of the heat transfer through a multi-layer textile containing an electrical heating band (to be used inside gloves). Several parameters were analysed for different environmental conditions, namely heating wire distribution, heating performance versus power consumption, battery duration, effect of metallization, etc. The resulting information provided valuable data for the optimisation of the prototype, allowing the acceleration of the development cycles.

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