ANNO LXXXVI - SERIE VI - BOLLETTINO - SPECIALE STRESA 2010

A CAMPIONE

Spedizione in abbonamento postale - 70% - Aut. Filiale di Vercelli

ASSOCIAZIONE ITALIANA DI CHIMICA TESSILE E COLORISTICA

Direzione: c/o FAST - Federazione delle Associazioni Scientifiche e Tecniche - 20121 Milano - P.le R. Morandi, 2 - Tel. 02 77790305 - www.aictc.org
Redazione: 13900 Biella - Via R. Germanin, 3/a
DIRETTORE RESPONSABILE: Bruno Marcandalli

Key note, Plenary Conference

The world of technical textiles
New opportunities offered to the sector of traditional textiles and development of innovative applications in non-conventional sectors

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Dramatic changes in numbers of employees as well as in companies throughout Europe require new strategies to transfer traditional textiles and technologies into innovative applications in the field of technical textiles. Different examples for such innovative products and technologies and the diversification processes are shown.

D01 - Photovoltaic textiles: myth or reality?

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Portable electronic devices need a wireless, mobile, and sustainable energy supply in order to overcome the constant problem of batteries running out of power. Their decreasing energy demand means that even portable solar cells can provide the needed energy (1-5 W). Different requirements have been satisfied: usability, comfort, reliability, versatility, integration, fashion, washing, and in particular conformal flexibility. Silicon based flexible thin-film solar cells suggested significant solutions but intrinsic limits of this technology hindered and delayed the advent of real products in the market; for someone they represent a myth. The application of novel photovoltaic technologies, based on dye sensitized solar cells (DSSC) or all organic cells could unfreeze actual stand by. Some recent photovoltaic approaches based on these novel concepts are here described to sustain the reality of these innovative solar cells.

D02 - CNT treatments on natural fabrics: properties and possible applications

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Carbon nanotubes (CNTs) are compounds made of only carbon atoms with a cylindrical structure composed by a sequence of benzene, having very strong chemical bonds. In the last years, several studies were carried out for the integration of these nanoparticles into different matrices (aqueous and organic dispersions, thermoset-

ting and thermoplastic polymers,...), in order to obtain materials showing interesting mechanical and electrical properties.
Applications of CNTs in textile field regard mainly the obtainement of yarns and/or fabrics for composites manufacturing and electronic applications. Several studies were focused on the integration of such nano-particles inside textile structures trough complex and expensive techniques, still at lab scale level and requiring special chemicals and machineries. Instead the development of a simple impregnation process, fast, low cost and potentially applicable at industrial level on natural yarns and fabrics, allowed to explore many different applications, including wearable products. The main requirements for using this processing method are related to the porosity of the support and proper choice of the solvent and binding agent, in function of the textile material to be doped. The main advantage of such impregnation process is related to the good workability and aesthetic affect of the final textile product.
Impregnation trials of a piece of cotton fabric in a bath containing a proper dispersion of CNTs and further dyeing procedures brought to the obtainement of a black fabric (Caleotex). An evaluation of its properties in terms of electrical conductivity/resistivity, thermal properties (even when activated by a power source), breathability, flexibility, softness, mechanical and washing resistance was performed, in order to find a suitable application field.

D03 - Study of flame retardancy properties of nanoparticle-based textile fabrics

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Different nanoparticle-based textile fabrics having promising flame retardancy properties were produced by three different approaches. First, immersion of the fabrics (cotton, polyester and blends of them are used) into an aqueous nanoparticle solution, followed by the final thermal treatment of nanoparticles. The textile material put in contact with the dispersion of nanoparticles absorbs them and, because of the formation of bindings according to fibre typology and nanoparticles, prevents any release. In addition, Plasma and sol-gel approaches were used in comparison with the immersion treatment in order to improve the flame retardant properties of textile fabrics under study. Cone calorimeter was used to measure flame retardant properties of loaded textiles.

D04 - Functionalized sols for textile application

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Nanotechnology is an innovation motor for many industrial fields. Technological knowledge and research are found in research and development projects for the textile industry and will certainly lead to medium-term innovation boosts.
Creation of nano structures on or in fibres or textiles can be split in two groups: First of all, changes in fibre production will normally modify the fibre volume. The difference is a "surface" finish or coating of the textile surface or the yarn with nanotechnology has the big advantage that the textile finisher can apply it individually and flexibly. Further effects were under process for textile application after the success of iSys AG and iSys MTX. iSys HPX, a synergetic blend of inorganic-organic sol with polysiloxane, was developed to offer alternatives for hydrophobic finishes without fluorcarbon chemistry. Another different application is the vector protection finish based on the active substance permethrine bond to the fibre with iSys SYN, a synergetic blend of inorganic-organic sol with polyurethane.