



Enzymatic aqueous preparation for the surface functionalization of paper or cellulosic substrates

A new biotechnological product for the chemical modification of the surface of cellulosic substrates has been patented. The bioproduct is obtained from an enzyme-mediator system, and several properties can be easily conferred to substrates applying very low concentrations of this enzymatic product in their surface. Partners to further develop the product and/or to establish commercial agreements along with technical cooperation are sought.

The Challenge

Obtaining new materials with enhanced properties using environmentally friendly methods is one of the main research fields in order to develop products for packaging, medical, and transportation industries, especially in a global context where the environmental awareness of companies and institutions is growing. Enzymes are capable to catalyze coupling reactions that have application potentials in various areas. Several works reported the ability of Laccases to functionalize cellulosic fibers to achieve for example internal sizing of paper, or to obtain paper sheets with antimicrobial and antioxidant properties; other works reported that Laccases can be used to functionalize the wood surface to improve the binding of fungicides. However, enzymatic reactions usually take a lot of time, making this kind of treatments not feasible to be applied in industrial processes. There's an increasing interest in developing enzymatic-derivate products and methodologies to be integrated easily in the industrial processes, without requiring a big change in the industrial equipment.

The Technology

The present invention refers to an isolated enzymatic aqueous preparation for the fast and low-energy functionalization of cellulosic substrates. The product comprises at least one enzyme (oxidoreductase type), and a natural or synthetic product which contains in its structure a phenol or an alcohol group, that has optionally one or more hydrophobic chains, or at least a sterol group. The enzymatic product is prepared outside the application point and, once the bioproduct has been obtained, can be applied directly on the surface of the substrate to be functionalized. As the product has similar rheological properties to water, it can be applied using simple and fast methods, such as "size press", sprayers, immersion or metering bar.

Innovative advantages

- Easy and versatile formulation, with no need of high investment for application.
- The product doesn't need to be prepared in situ for application. It can be delivered as an already prepared product.
- Products to confer different properties can be prepared by this technology.
- The surface treatment can be applied in several points in the paper machine.
- Very low concentrations of the product are required since it is applied superficially.
- The application doesn't require additional investment. Existing systems for surface treatment can be used.
- Product can be prepared at high concentration, and diluted before application.

Current stage of development

Technology has been tested in a laboratory scale, using different kinds of substrates and synthetic/natural products as well as enzymes. Several surface application methods had been successfully tested. Technology is ready for industrial application.

Applications and Target Market

It could be of interest for packaging industries, packaging development research, paper and board industries, food industry, and food preservation research. As well as companies who develop chemical or biochemical products could be interested.

Reference number

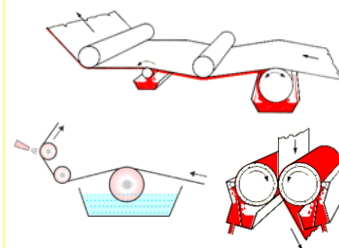
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Several properties can be conferred to cellulosic substrates using this enzymatic product



Water contact angle images of paper after surface treatment using the bioproduct Non-treated (left) and treated (right).



Several application methods for the surface treatments using this technology

Business Opportunity

Technology available for licensing with technical cooperation

Patent Status

EP, US application

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