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Ecological clothing made of organic cotton dyed with natural dyes, protecting against the harmful effects of UV radiation and the development of microorganisms

In recent years, conscious consumers have been looking for clothes with special properties, made of natural raw materials. A new technology of ecological textile materials for clothing was developed at the Łukasiewicz Research Network - Textile Research Institute and implemented in a modern industrial dyeing plant JANIS Sp. z o.o. Sp. K. These materials are made of natural cellulose fibers - cotton or linen, which have been permanently dyed with natural dyes of plant origin, e.g. *Reseda luteola* or animal origin, e.g. cochineal, obtained from dried *Coccus cacti insects*.

Natural dyes do not have affinity for cellulose fibers. So additional pre-treatment process with cationic agents is required. As a result of cationization, the negative electric potential of the cellulose fibers changes into a positive one, which increases the affinity of the treated fibers to natural dyes. The color obtained should be fixed.

The innovation of the invention, covered by the patent application **P.435703** is a method giving (in industrial conditions) protective properties against UV radiation and the development of microorganisms to the cellulose materials, through their permanent coloring with natural dyes, applied after the pre-treatment process with a cationizing agent, fixed with natural copper salt - chalcantite.

The obtained materials are characterized by:

- very good protective properties against UV radiation (UPF>50),
- strong antibacterial effect against gram-negative bacteria - *Escherichia coli* and gram-positive one - *Staphylococcus aureus*.
- high color fastness to washing, perspiration, rubbing and light,
- use of natural raw materials (natural cellulose fiber - standard or organic cotton, linen, natural dye, chalcantite),
- biodegradability,
- high physiological comfort of using clothing and masks made of them,
- safety for skin – lack of skin irritation according to OECD procedures.



Ecological clothing made of natural materials, with barrier properties to UV radiation and biostatic, provides an effective protection for people staying outdoors for recreational purposes, practicing sports and for representatives of many professional groups, working in the open area or having contact with light emitted by artificial sources. Such products can also be used for protective elements, e.g. masks used in the prevention of bacterial and viral infections, including COVID-19 infections.

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