

Photochromic Wool Fabrics from Nano-Porous Silica Coating

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Background

Photochromic dyes undergo a reversible colour change upon irradiation with UV light. Applying this functional dye to a textile will impart the textile with both a colour changing effect and a UV protective function.

Objective

The present work was aimed at using silica containing a photochromic dye as functional coating to realize photochromic wool fabrics. The following aspects have been addressed in the project:

1. Encapsulating photochromic dyes with silica via a sol-gel process and applying the hybrid silica onto wool fabric,
2. Examining the effects of silica precursors on the photochromic performance (e.g. colour changing speed, optical absorption, etc), adhesion of coating (e.g. washing, abrasion fastness, etc) and fabric properties (e.g. surface hydrophobicity, handle, etc)
3. Effective approaches to improve the coating durability
4. Effective approaches to stabilize the photochromic properties

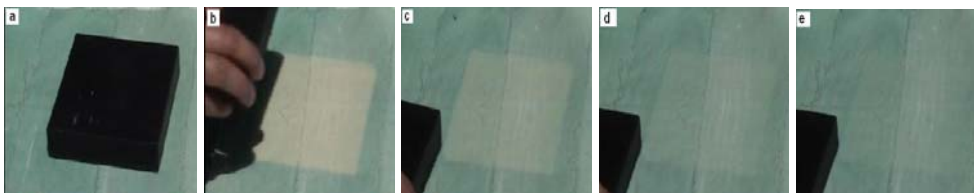
Methodology

The photochromic dyes were embedded into silica matrix via a sol-gel technique, and the dye-containing silica was then applied on the surface of wool fabric.

Progress

Several types of silica coatings have been prepared and the effects of silica type on the optical and fabric properties, as well as the coating adhesion have been investigated. The coated wool fabrics show a very good photochromic effect, with the natural fabric softness retained. Also, the bonding strength and photo-stability of the coating have been improved by addition of special additives to the silica matrix.

The photos below show the colour change of the photochromic fabric when the fabric is exposed to sunlight. The fabric is originally colourless in the shade and blue-green in direct sunlight.



(The images were recorded in every 0.5 seconds from a to e in sequence.)