DEVELOPMENT OF SELF – CLEANING TEXTILES BY INCORPORATING PHOTO CHEMICALLY ACTIVE TiO$_2$ NANO- PARTICLES

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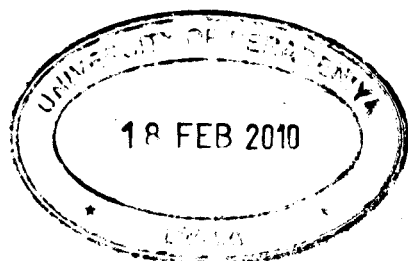**MASTER OF SCIENCE IN ANALYTICAL CHEMISTRY**

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DEVELOPMENT OF SELF-CLEANING TEXTILES BY INCORPORATING PHOTOCHEMICALLY ACTIVE TiO$_2$ NANO-PARTICLES

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The development of new textile material was achieved by the incorporation of photo-active TiO$_2$ nano-particles on to cotton fibers. The TiO$_2$ nano-particles were chemically bonded to the surface of cotton fiber using two deferent methods.

In both methods the first step is the activation of cotton surfaces by excessive cleaning to remove dust particles and the impurities. For this, detergent washing and acid bath washing steps were done.

In the first method, the activated cotton surfaces were treated with succinyl chloride to enable to attach succinyl functionality to the cotton. Then the TiO$_2$ nano-particles (Degussa P25) were chemically bonded on to the succinyl chloride monolayer.

In the second method, the OH groups on the activated cotton surfaces were chlorinated using PCl$_5$ as the chlorination agent in acetone medium. The TiO$_2$ nano-particles were chemically bonded on to the chlorinated cotton fiber by immersing the chlorinated cotton pieces in a solution of Degussa P25.

The characterization were done using X-ray diffraction (XRD) spectroscopy as well as the X-ray fluorescence (XRF) spectroscopy. The XRD analysis of samples further supported the XRF data.

Finally, the modified fibers were treated with dyes and stains. Then their auto-cleaning ability was studied by measuring the color changers and decreasing in characteristic optical absorption of the dye upon exposure to sunlight.