A more earth-friendly way to make bright white cotton fabrics

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With a growing number of consumers demanding more earth-friendly practices from the fashion world, scientists are developing new ways to produce textiles that could help meet rising expectations. They report in the ACS journal *Industrial & Engineering Chemistry Research* one such method that can dramatically reduce the amount of energy it takes to bleach cotton while improving the quality of the popular material.

Quan Zu and colleagues point out that the cotton industry's current whitening techniques require bleaching the natural fiber at very high temperatures with hydrogen peroxide. Although this method results in the bright white material consumers have grown so fond of, it also lowers the quality of the material and takes a lot of energy to carry out. Multiply that by the 7.3 billion pounds of cotton produced in the U.S. alone, and the energy needs soar. To cut down on the energy the textile industry uses to make cotton, Zu's team targeted its efforts toward lowering the bleaching technique's high temperatures.

They developed a novel compound that, when used with hydrogen peroxide, drops the bleaching temperature down to 140 degrees Fahrenheit from 200 degrees. The authors estimated that 60 degree difference would result in a process requiring less than half the energy as the commercial technique. It also produced less wastewater, improved the weight of the material and performed its original function—whitening the cotton. Since many materials destined to become clothing eventually take on various hues, the scientists also tested dyes and found the cotton bleached at the lower temperature could

be made just as vibrant as its high-heat counterpart. They successfully showed the treatment's effectiveness on knitted cotton fabric in commercial scale trials.

More information: "A Novel Low Temperature Approach for Simultaneous Scouring and Bleaching of Knitted Cotton Fabric at 60°C" *Ind. Eng. Chem. Res.*, Just Accepted Manuscript, DOI: 10.1021/ie500062f

Abstract

Exceedingly high temperatures (e.g., ~98°C) are used to perform hydrogen peroxide (H2O2) bleaching of cotton fabrics in industrial practice. Such harsh conditions lead to high energy consumptions and high fabric damages. In recent years, the industry and academic communities have conducted extensive research to reduce the temperature for industrial cotton bleaching processes. In our research, we have developed a new H2O2 activator based on amino nitriles and achieved the low bleaching temperature of 60°C. All the data demonstrated that in the presence of the new H2O2 activator, the combined scouring/bleaching of the knitted cotton fabric could be performed at 60°C with the fabric's whiteness and strength comparable to that treated using the traditional method at 98°C. The fabric treated with the low temperature procedure has lower fabric weight loss; some of the hydrophobic substances were retained on the fiber surface. We found that such an increase in hydrophobicity of cotton had little effects on the whiteness of the treated fabric after application of optical brighteners, shadedepth, color change after washing, and colorfastness to washing and rubbing. The higher weight retention of the treated cotton fabric also increased the value of the treated cotton knitted fabric. The removal of less substance from cotton also resulted in lower COD for the treatment bath, thus providing additional environmental benefits. Moreover, the low temperature scouring/bleaching procedure had significantly lower energy consumption than the traditional procedure.

The effectiveness of this new technology has been proven in our industrial scale trials.

Provided by American Chemical Society

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