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FOURIER TRANSFORM INFRARED (FT-IR) MICRO-SPECTROSCOPY ANALYSIS OF STICKY COTTON YARNS

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Abstract

One cotton bale contaminated with aphid honeydew, one cotton bale contaminated with whitefly honeydew and 2 bales of non-contaminated cotton were selected for this study. From these bales, four cotton mixes were obtained. Mix 1 consists of 300 pounds of cotton contaminated with aphid honeydew; the High Speed Stickiness Detector (H2SD) reading was 21. Mix 2 consists of a blend of 150 pounds of cotton contaminated with aphid honeydew and 150 pounds of non-sticky cotton; the H2SD reading was 11. Mix 3 consists of a blend of 43 pounds of cotton contaminated with white fly honeydew and 257 pounds of non-stiky cotton; the H2SD reading was 11. Mix 4 consists of a blend of 86 pounds of cotton contaminated with white fly honeydew and 214 pounds of non-sticky cotton; the H2SD reading was 21. The lint from the four mixes was rotor spun (22Ne). The yarn defects causing ends-down during the rotor spinning process were collected for each mix and examined by Fourier Transform Infrared (FT-IR) micro-spectroscopy. The Universal Attenuated Total Reflectance (UATR), with diamond ZnSe crystal, was used to collect the FT-IR spectra because it does not require sample preparation. The FT-IR spectra of the yarn without defects were subtracted form the FT-IR spectra of the defect. The results obtained showed that FT-IR spectra of the yarn defects relative to Mix 1 were similar to those of Mix 2 and the FT-IR spectra of the yarn defects from Mix 3 were similar to those from Mix 4. To further analyze these spectra, the second derivatives of the original spectra were calculated. They were chosen because they have sharper, more discriminant features than the original spectra. The results showed that the vibrations at 1150, 816, and 783 cm^{-1} present in the second derivative spectra of artificial white fly honeydew were also present in the spectra of mix 3 and mix 4 revealing a possible fingerprint of white fly honeydew using FT-IR. Further investigations on a large number of yarn defects were undertaken and the detailed results will be published in the near future.

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