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Mid-infrared Spectroscopy of Trash in Cotton Rotor Dust

Authors: Jonn Foulk, David McAlister, David Himmelsbach, and Ed Hughs

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Cotton always has trash associated with its fibers, which is known to affect processing efficiency. Rotor spinning is more sensitive to trash levels in cotton compared with ring spinning, the other major spinning system. Trash trapped in the rotor grove is typically pulverized cotton fiber and trash particles whose origins cannot be visually determined (e.g. leaf, fiber, bark, seed coat, etc.). New techniques or instruments are necessary to reliably provide rapid, consistent, and quantitative identification of cotton trash sources. The goal of this research was to identify the origins and to understand the impact of each type of pulverized substance on textile processing. Research has been done with infrared microscopy in order to confirm the utility of infrared mapping of cotton biological components. The mid-infrared region is between the wave numbers 4000 and 650 cm^{-1} and can be evaluated with Fourier-transform infrared (FT-IR) as a qualitative and quantitative analytical tool for organic substances. This study demonstrated the utility mid-infrared "fingerprinting" for qualitative identification of cotton contaminants. Mid-infrared spectroscopy was used to compare fiber and trash particles or dust with a spectral database of authentic samples to more accurately determine the source of spinning problems. Mid-infrared spectroscopy was able to predict the type of trash and demonstrated that the rotor dust accumulating in open-end spinning rotors appears to be hull and shale rather than seed coat fragments. This technique offers potential to study the influence of various types of trash on spinning efficiency.