ATTENUATED TOTAL REFLECTANCE AND REFLECTANCE APPROACHES FOR ANALYSIS OF TEXTILE FIBRES WITH FT-IR SPECTROSCOPY

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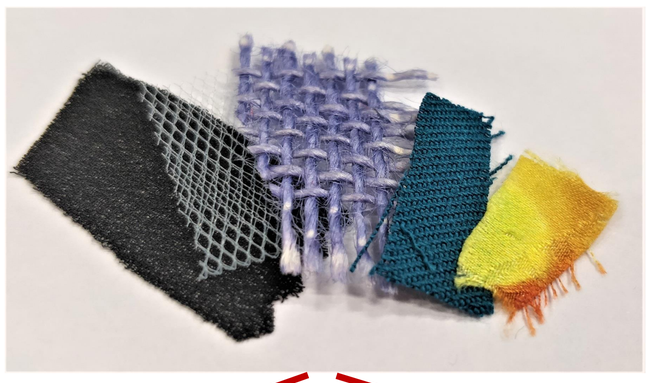
INTRODUCTION

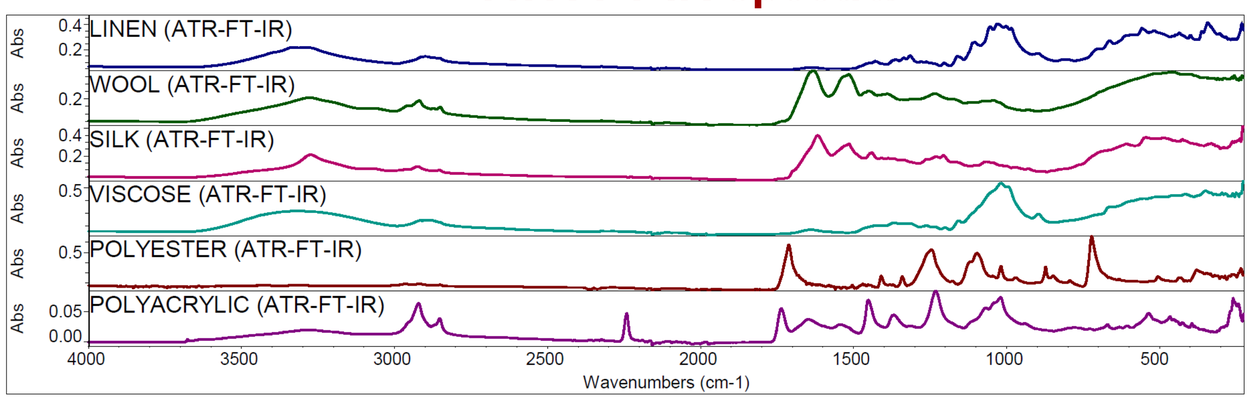
Textile are flexible woven materials, chemically complex polymeric materials. Due to the abundance and many similar properties of different textile fibres, identification with traditional methods like microscopy, dissolving and burning can be impossible. In this field less-destructive, easy and quick identification methods must be used. In this work almost non-destructive attenuated total reflectance (ATR), non-contact reflectance (r) approach with FT-IR microspectroscopy for the analysis of textile fibres was tested and compared.



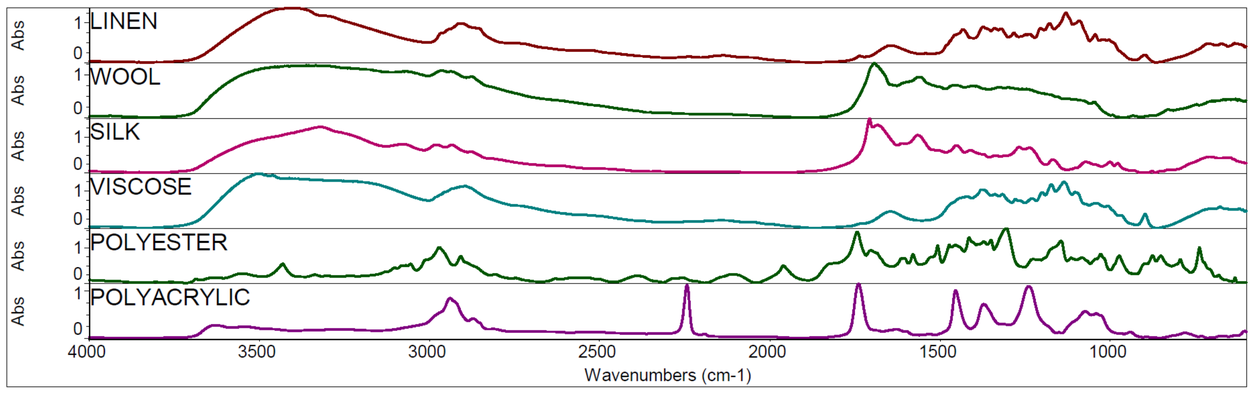
AIMS OF THE RESEARCH

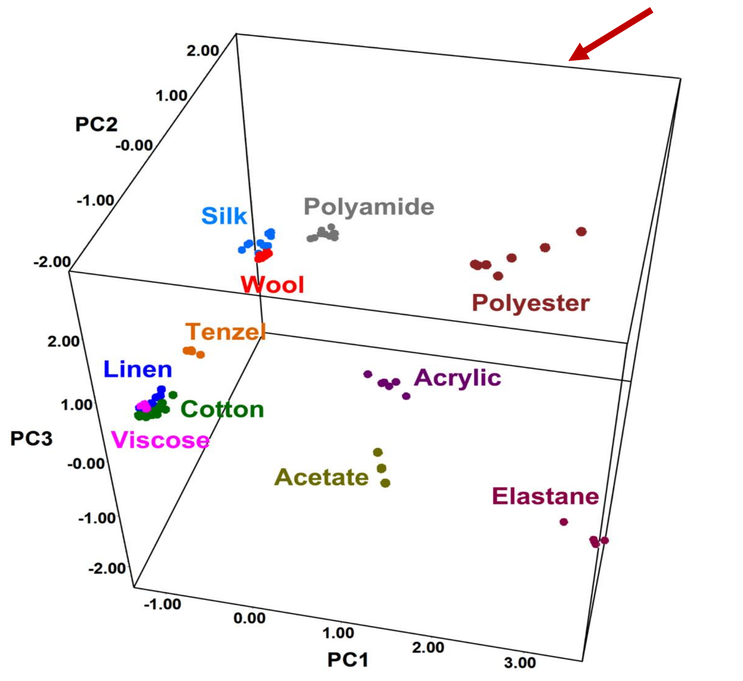
- Collection of standard textile fibre IR spectra
  - ATR mode
  - Reflectance mode
  - Full interpretation
- Classification method for easier identification using PCA

ATR-FT-IR spectra



r-FT-IR spectra





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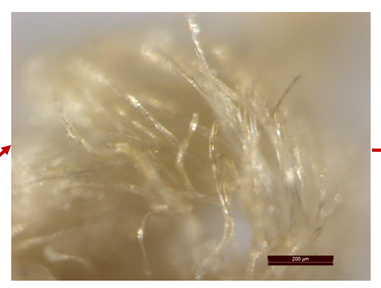
RESULTS

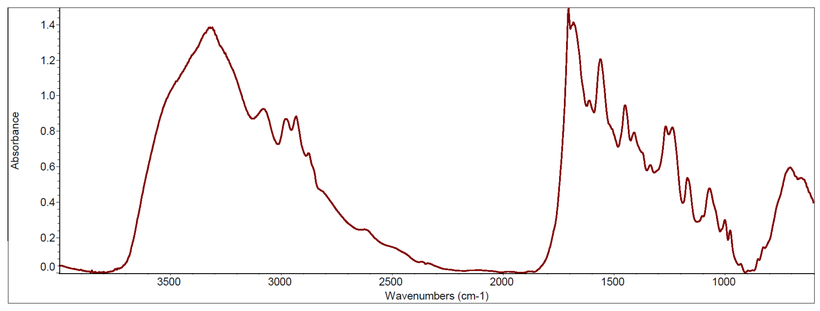
- Over 2000 ATR-FT-IR and r-FT-IR spectra of 16 different textile fibres (wool, silk, cotton, linen, jute, sisal, viscose, acetate, lyocell, glass, polyester, polyamide, polyacrylic, elastane, polyethylene, polypropylene) were recorded.
- Classification methods using discrimantant analysis based on principal component analysis were developed.
- Several case-study analyses were performed.

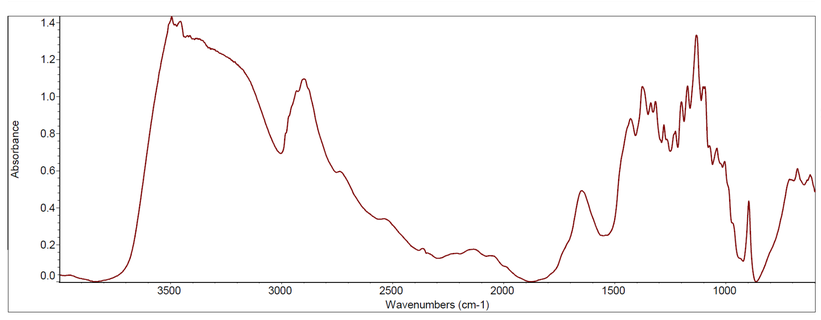
CASE STUDY EXAMPLE

Scarf from Estonian History Museum
(~ 1910)



r-FT-IR analysis





r-FT-IR analysis

Classification with TQ Analyst

Class	Distance to class
Silk	1.02

Classification with TQ Analyst

Class	Distance to class
Viscose	0.84

CONCLUSION

FT-IR spectrocopy with ATR and reflectance modes are very useful methods for identification of natural and synthetic fibres. These methods are quick, easy and in many cases non-destructive.

ACKNOWLEDGEMENTS

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