

Fourier Transform Infrared (FTIR) Microscope

Damage characterization of Aramid fiber ropes

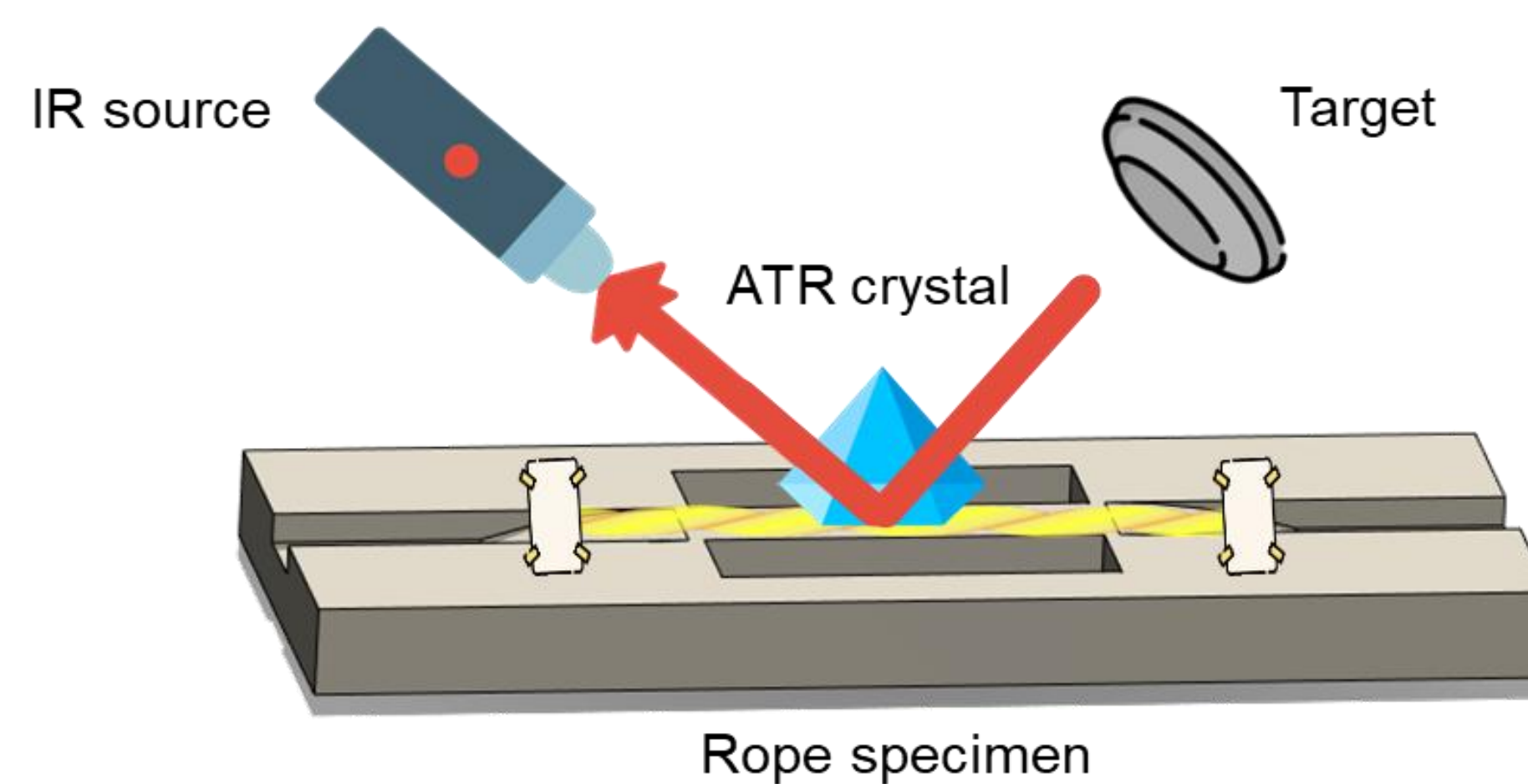
Tanmaya Mishra*, Oday Allan, and Matthijn de Rooij

Working principle

The IRT-5200 FTIR microscope includes a mid-band MCT detector (up to two detectors can be installed). IQ Mapping allows multi-point, line, area and ATR mapping experiments without moving the sample stage, in addition to single-point measurements. An optional automatic XYZ stage provides auto-focus and mapping or imaging analysis of larger sample areas [1]. Variety of measurement modes (Transmission, Reflection, ATR, Grazing Angle Reflection).



[1] Jasco IRT-5200 FTIR Microscope

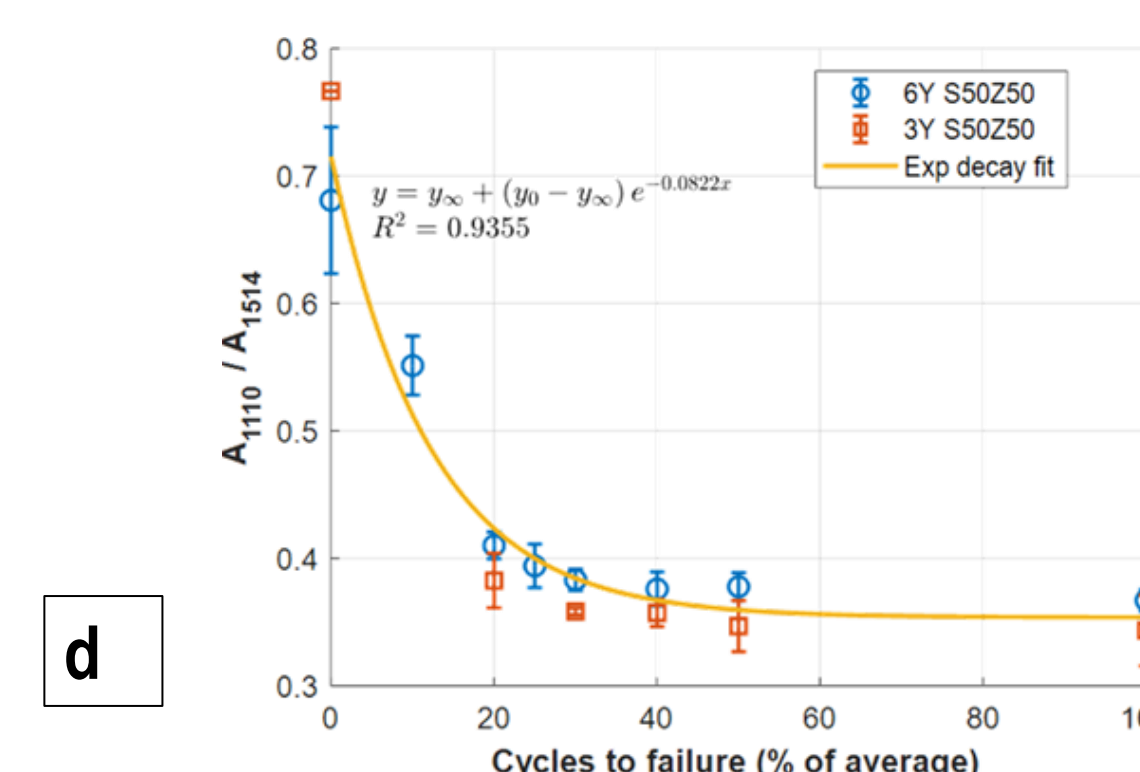
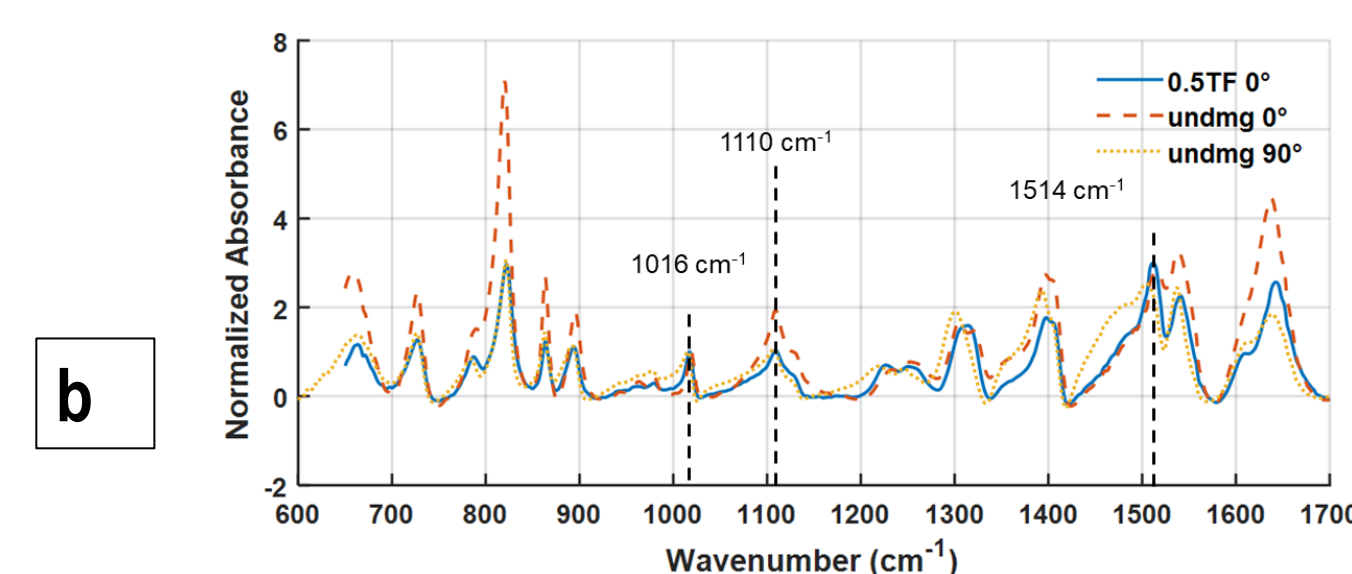
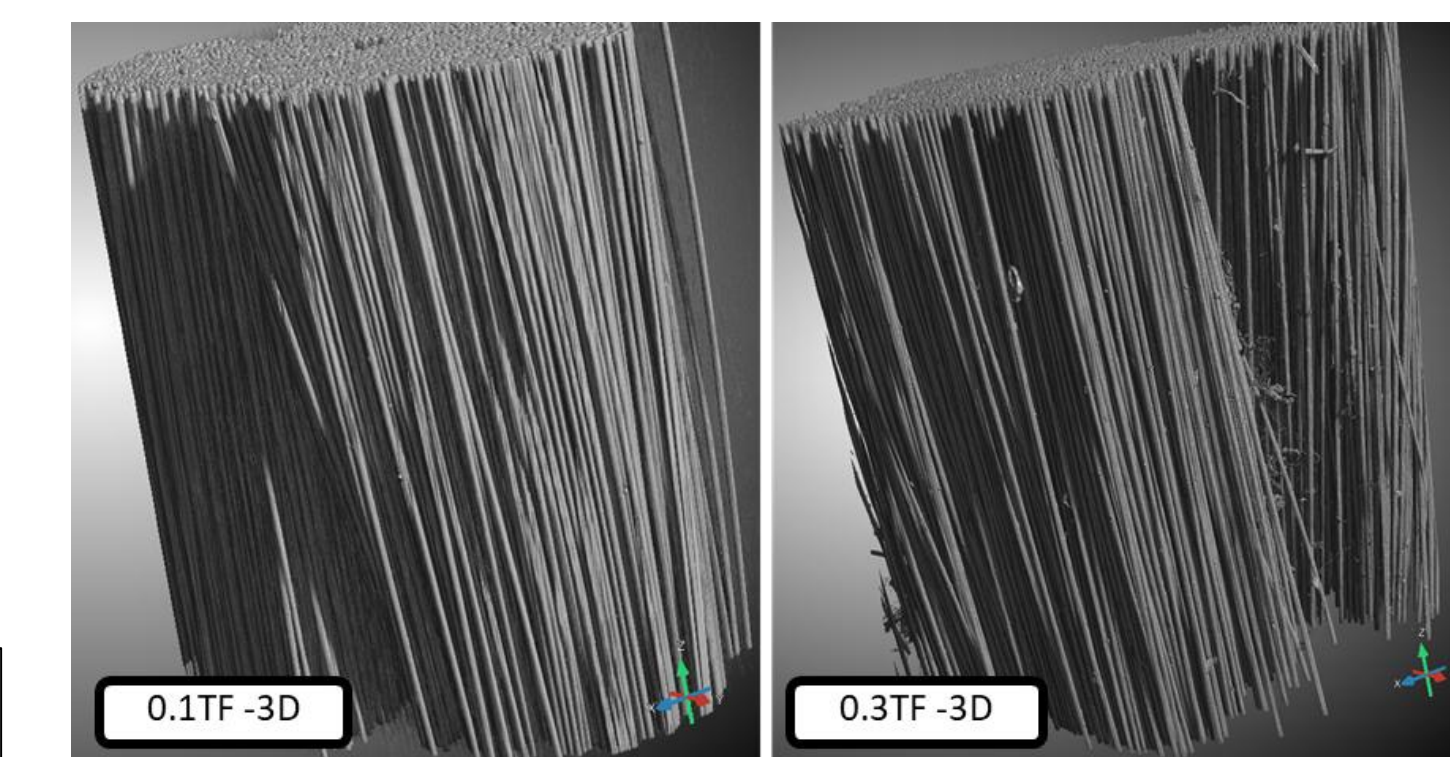


Schematic of ATR (Attenuated Total Reflectance) -FTIR measurement setup showing the diamond crystal in contact with the rope specimen [2]

[2] <https://doi.org/10.1016/j.polymer.2025.129224>

Results and discussion

Three-strand Twaron® ropes were subjected to cyclic bend-over-sheave loading, with damage localised at strand interfaces. Micro-CT and SEM visualisation confirmed fibrillation and internal wear, while ATR-FTIR spectroscopy showed changes in absorbance that correlated with interface damage, providing a non-destructive indicator of rope degradation and service life.



(a) Damaged ropes, their FTIR spectra (b) their CT scanned images and their (c) FTIR spectra plot vs damage levels [2]

UNIVERSITY
OF TWENTE.

Surface Technology
and Tribology

Tanmaya Mishra

t.mishra@utwente.nl