

Effect of Detonation on the Analysis and Comparison of Electrical Tapes

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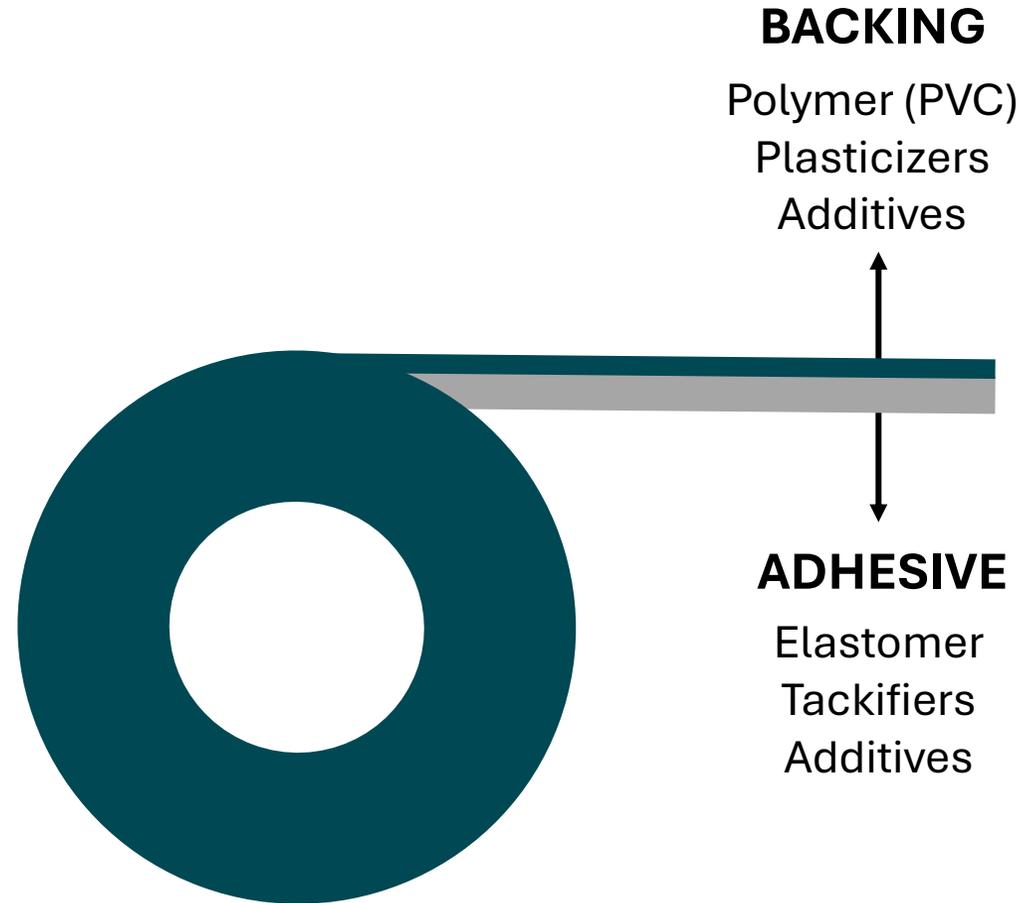
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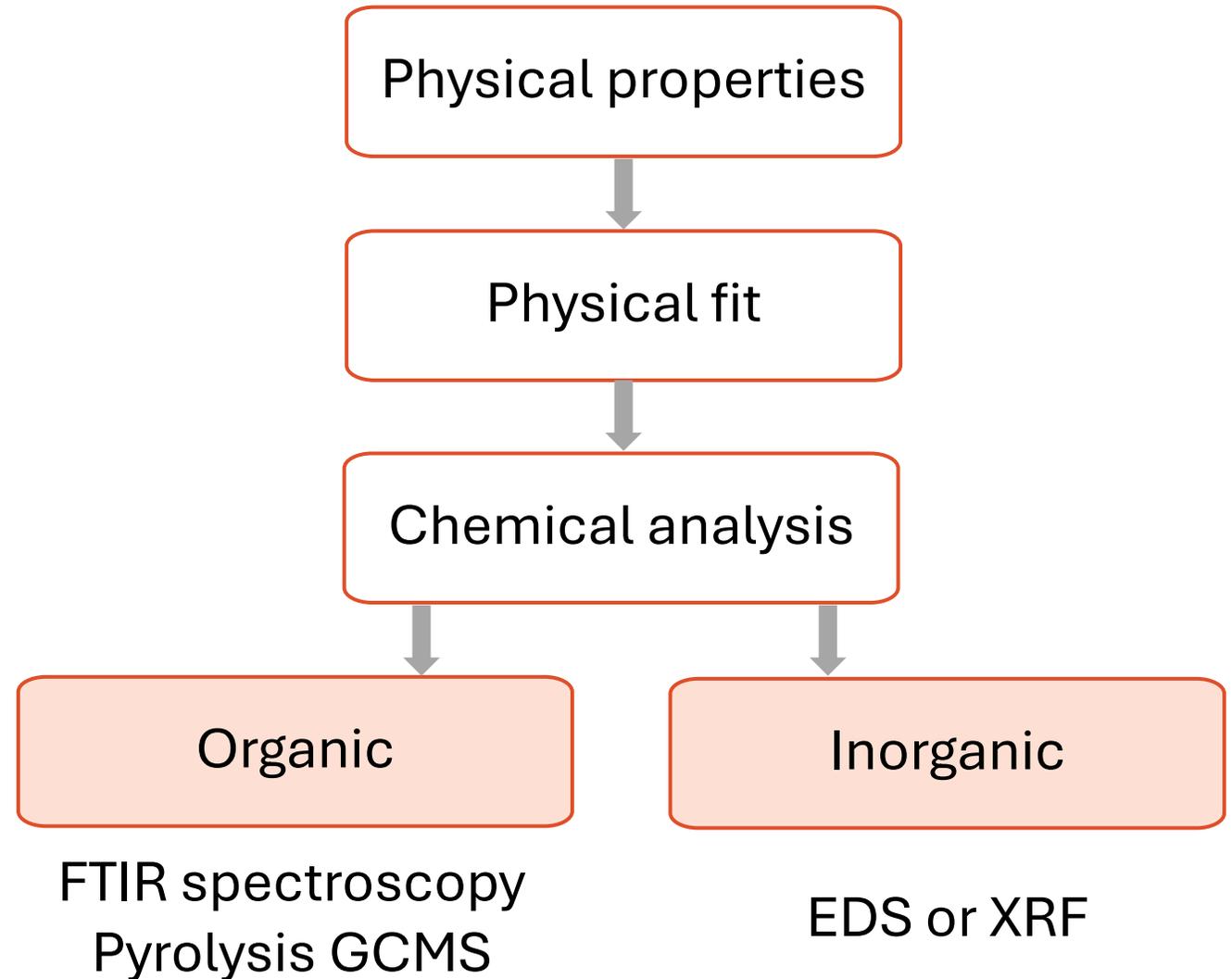
Electrical Tapes

- **Forensic interest:**
 - Fabrication of IEDs

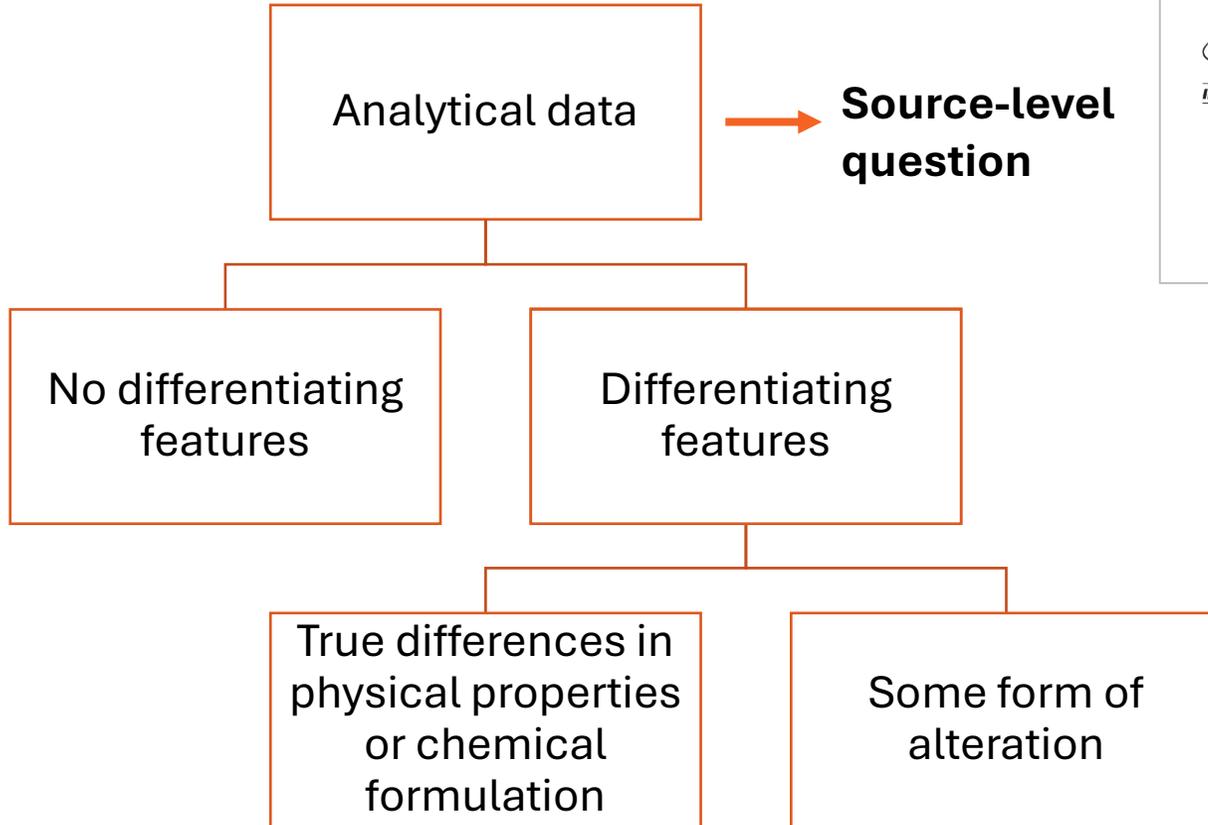


Analytical Scheme

- **Laboratory examination:**
 - Comparative
 - Source-level questions



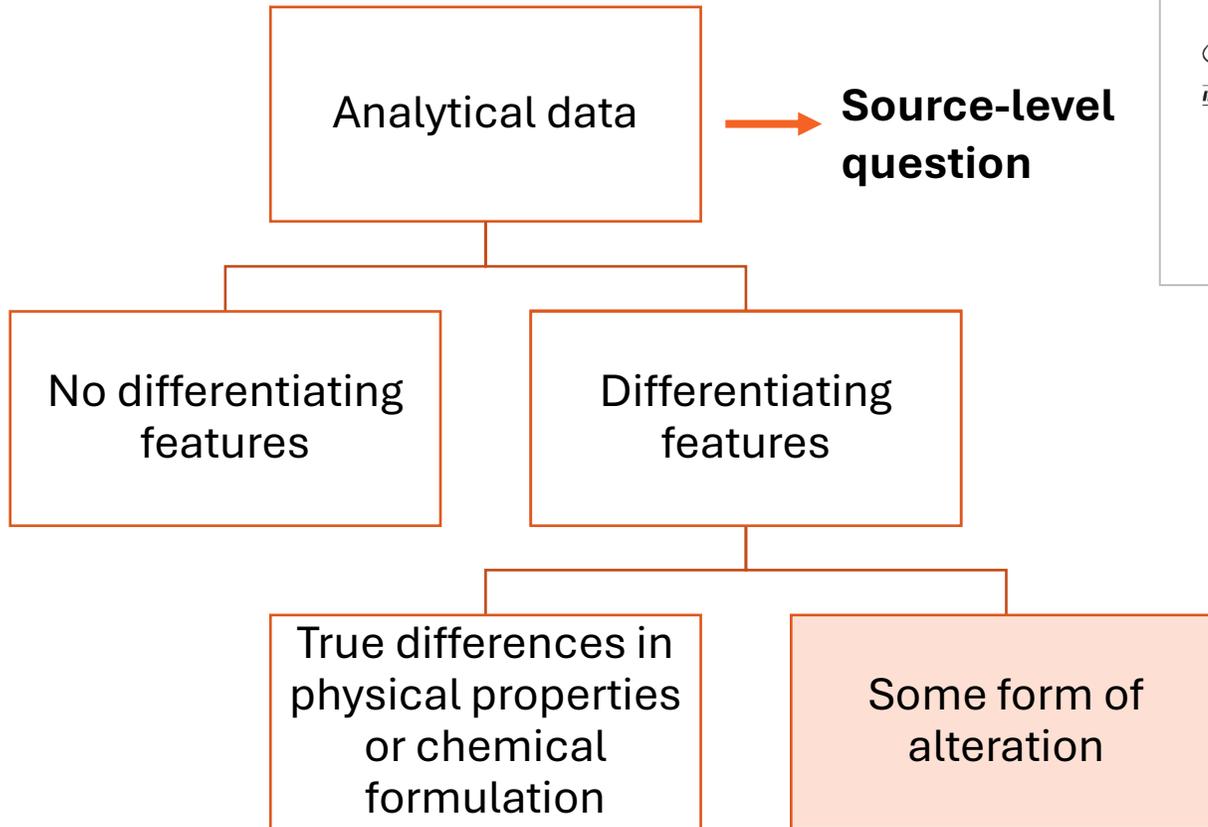
Problem Statement



Designation: E3462 – 25

Standard Guide for Interpretation and Reporting in Forensic Comparisons of Trace Materials¹

Problem Statement



Designation: E3462 – 25

Standard Guide for Interpretation and Reporting in Forensic Comparisons of Trace Materials¹

13.4 *Source Level Factors that Could Decrease the Significance of an Association:*

13.4.1 Common formulation of tape.

13.4.2 Limited number of features available for comparison.

13.4.3 Limited size.

13.4.4 Contamination, degradation, or damaged condition of the sample(s).



What does a **post-blast tape** sample look like? And how does it compare with a pristine one?



Conroe, TX

Experimental Design



30 **pristine** black tapes

2 sets of detonation
TNT explosive charge
PETN detonation cord



37 **post-blast** fragments

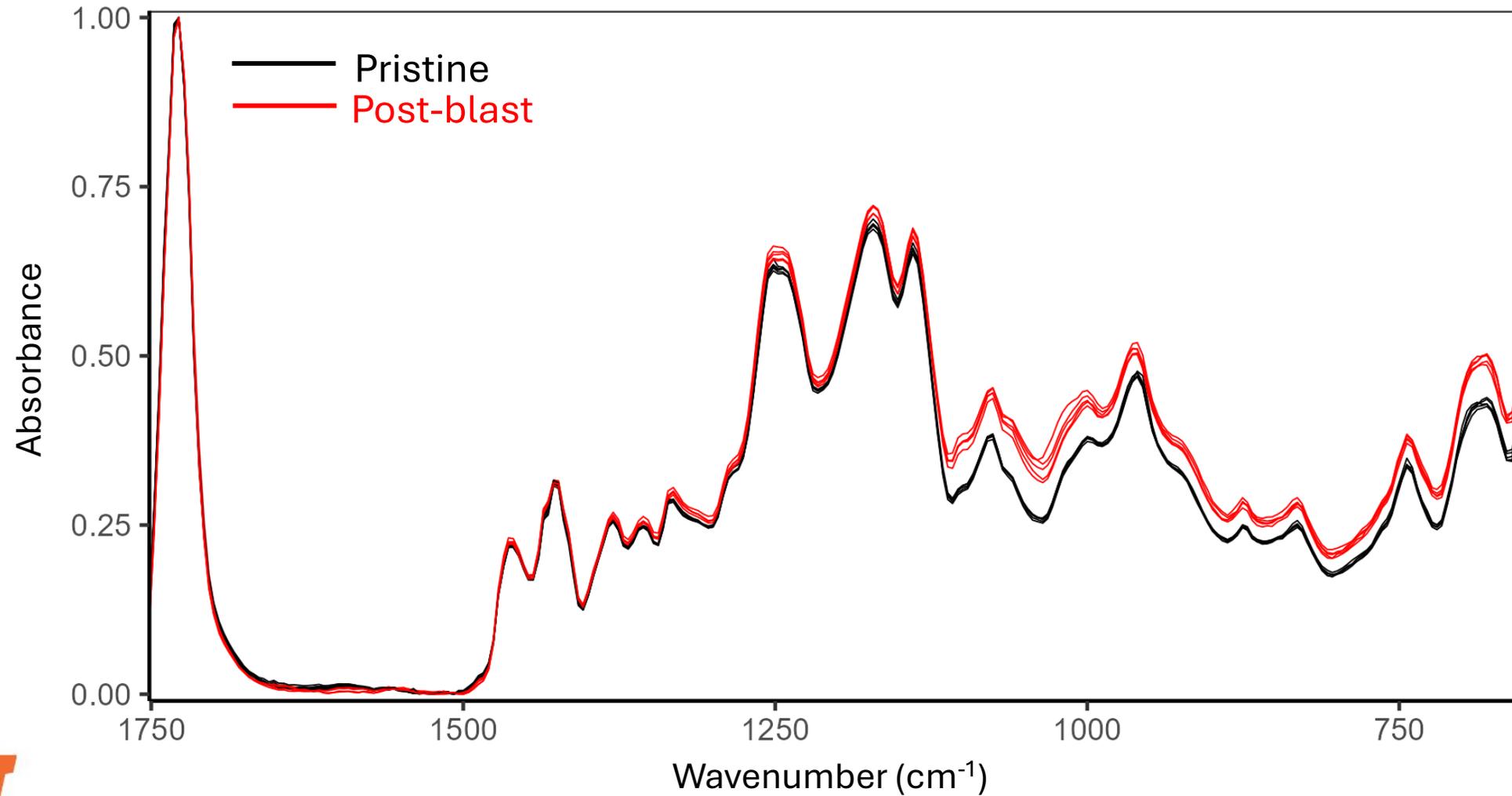
FTIR
GCMS
EDS



*Tape backings only
Solvent extraction + GCMS

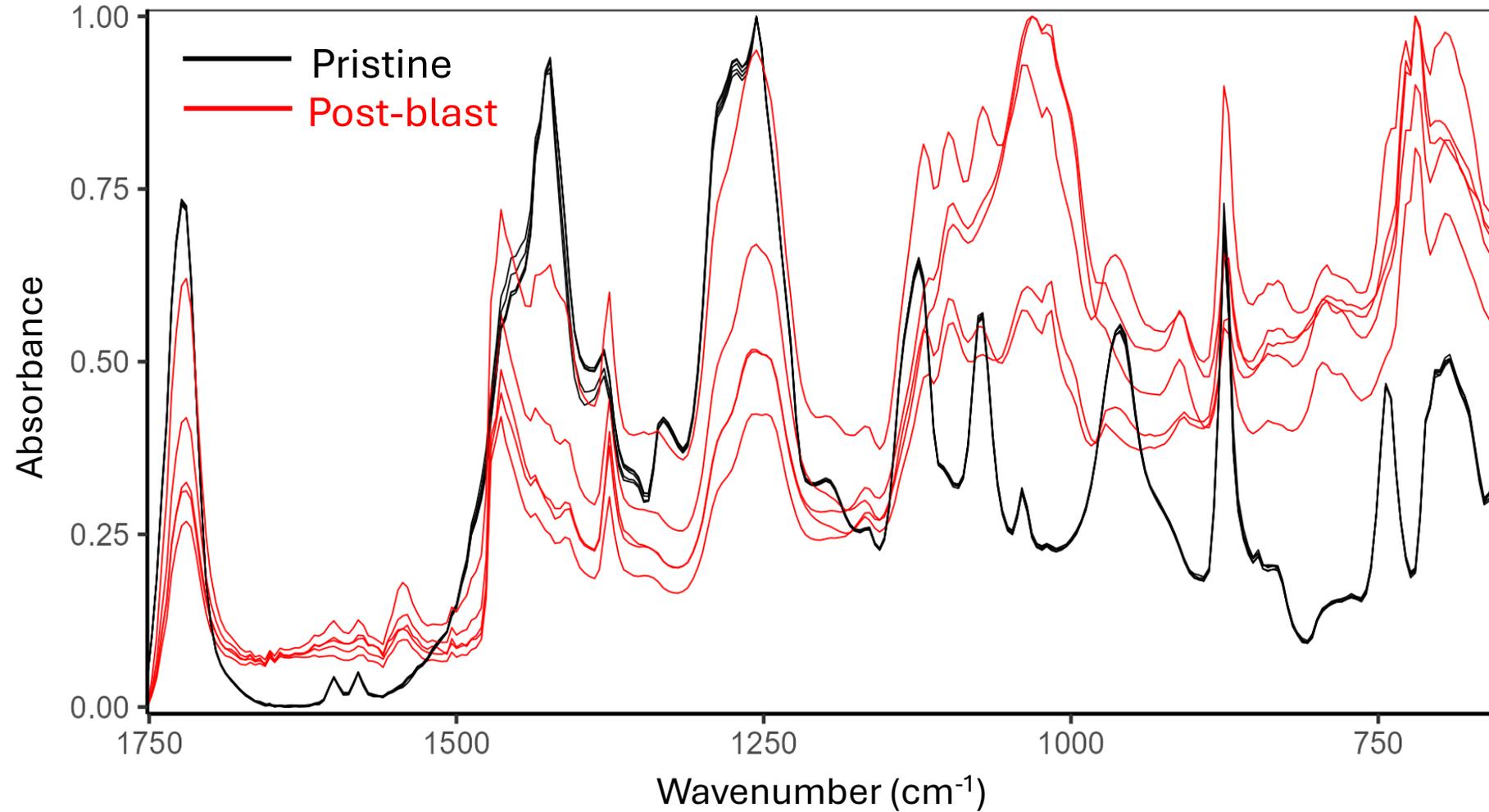


FTIR - Example 1



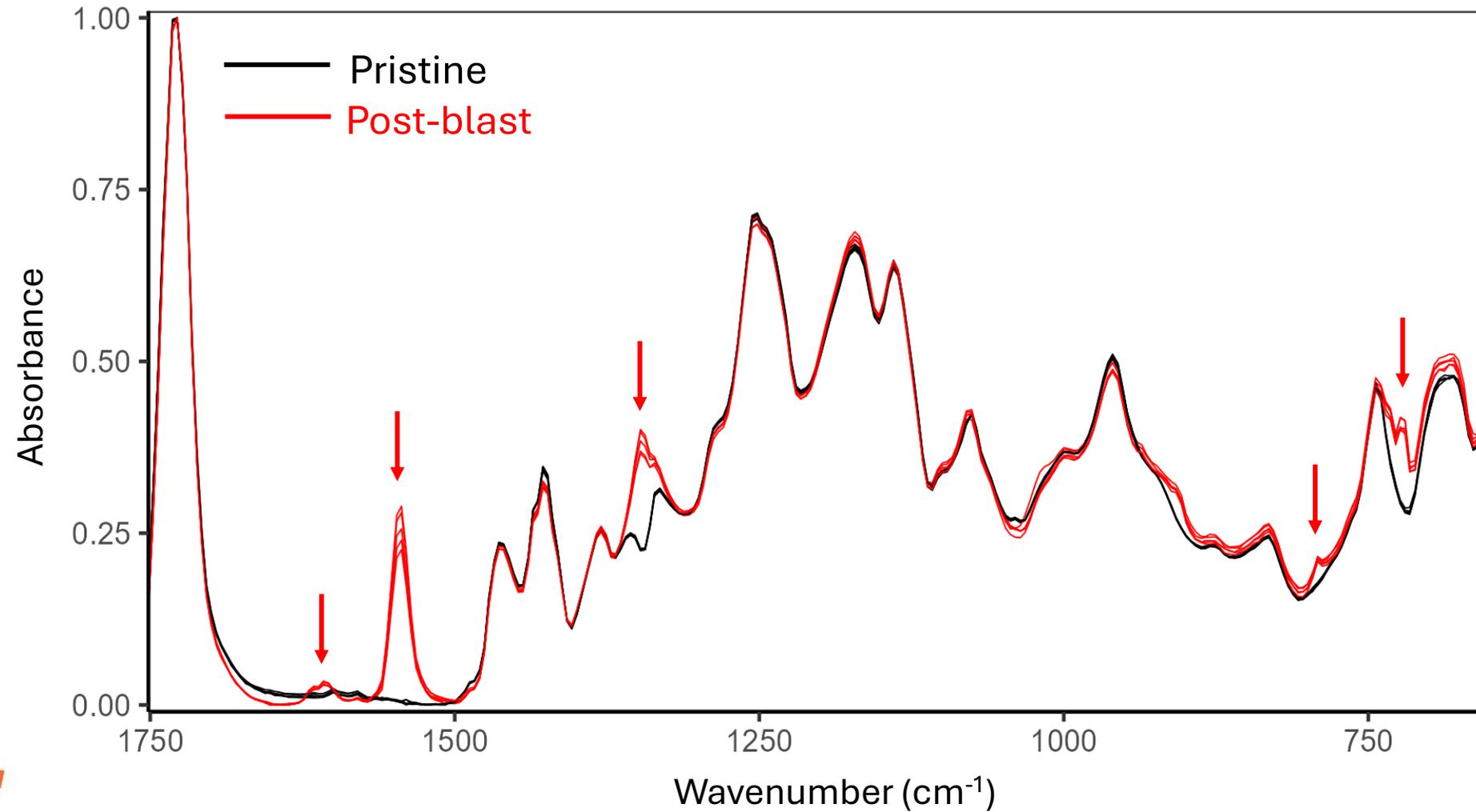


FTIR - Example 2

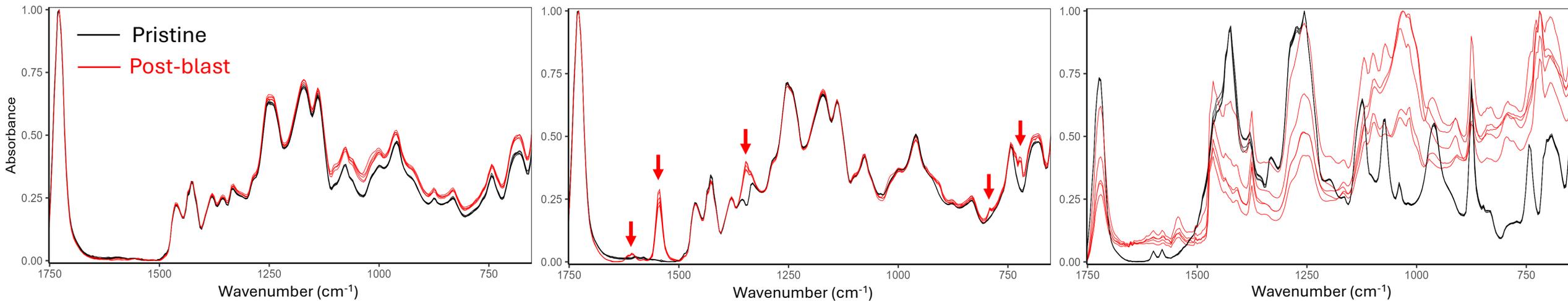




FTIR - Example 3



FTIR Spectroscopy



FTIR Spectroscopy

1. New spectral bands

TNT: 1550 cm⁻¹

1350 cm⁻¹

1100 cm⁻¹

PETN: 1400 cm⁻¹

840 cm⁻¹

2. Absence of minor bands

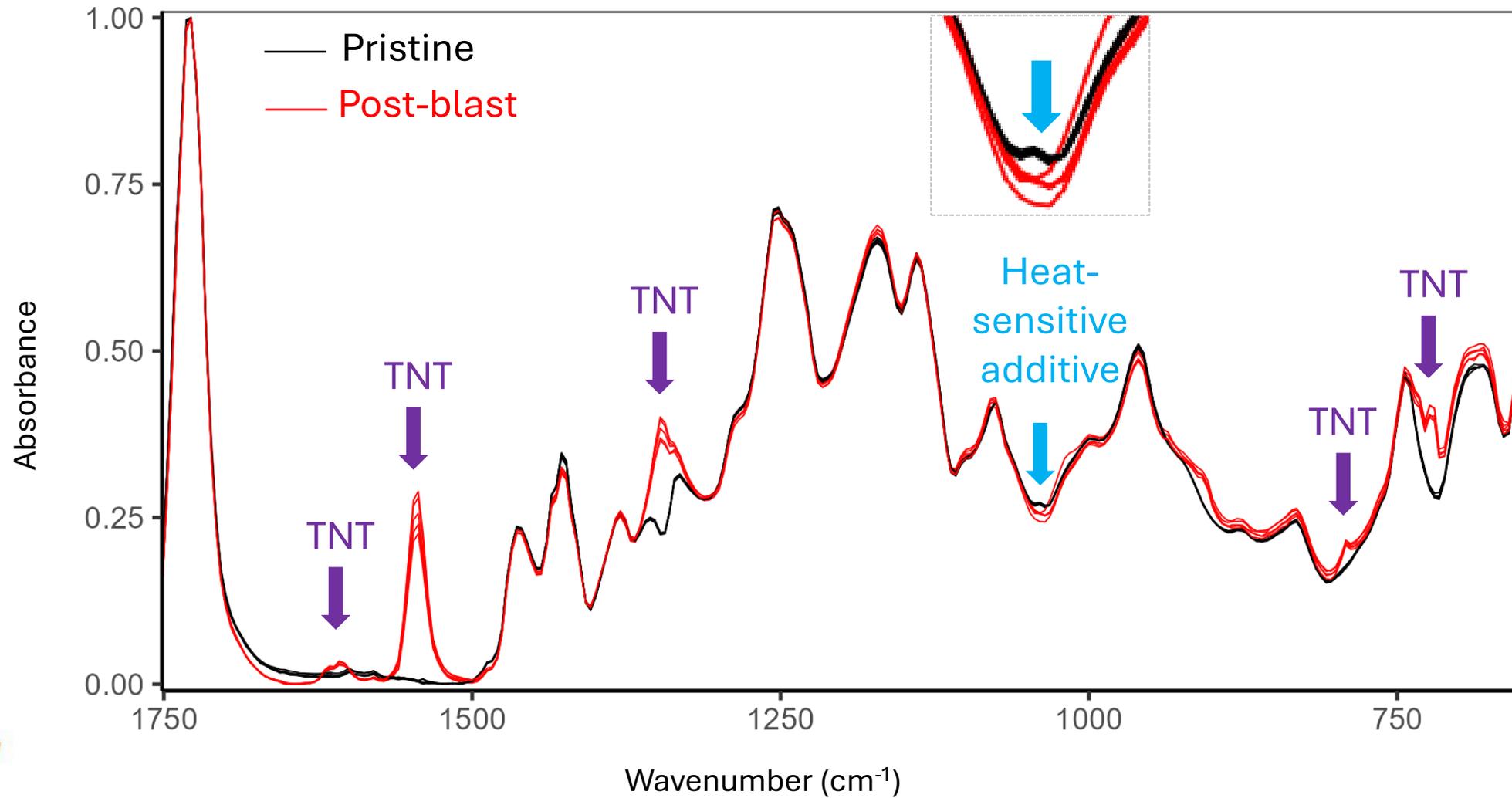
Heat-sensitive additives

3. Loss of resolution at 1270 cm⁻¹

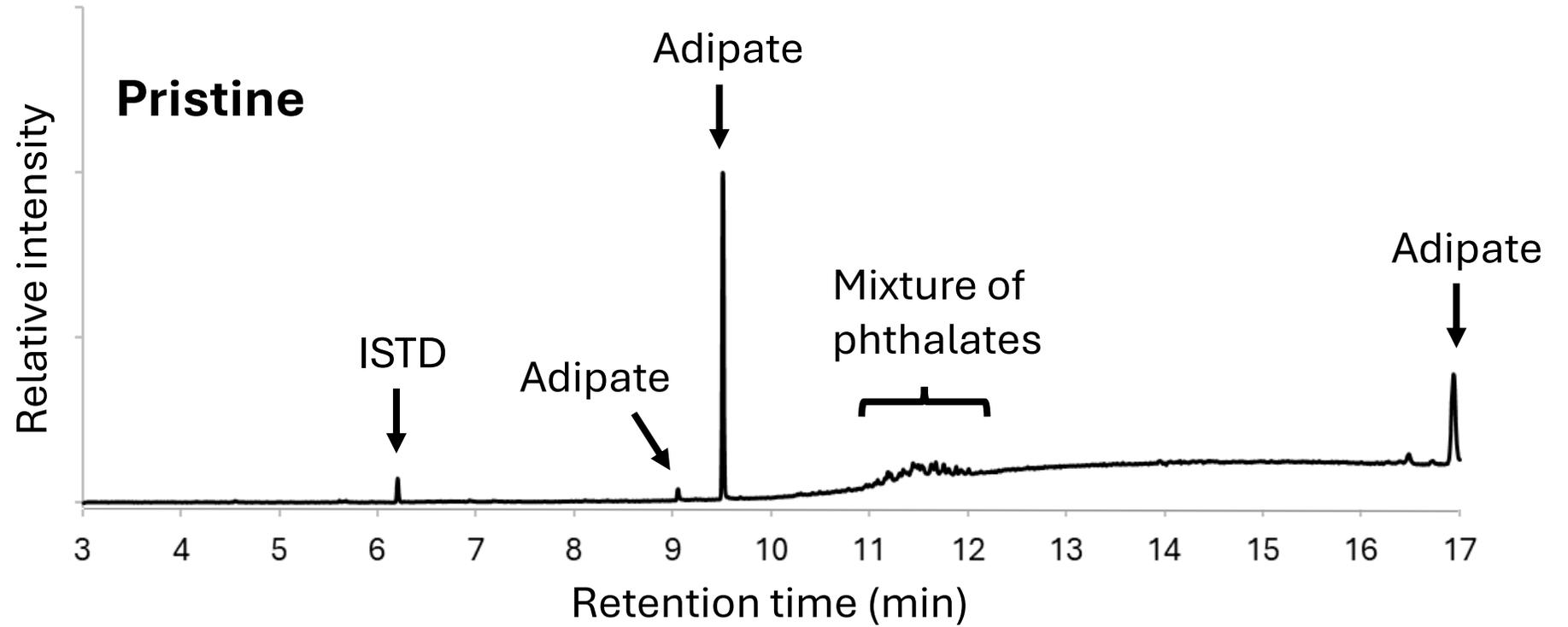
Carbonyl group

Plasticizer

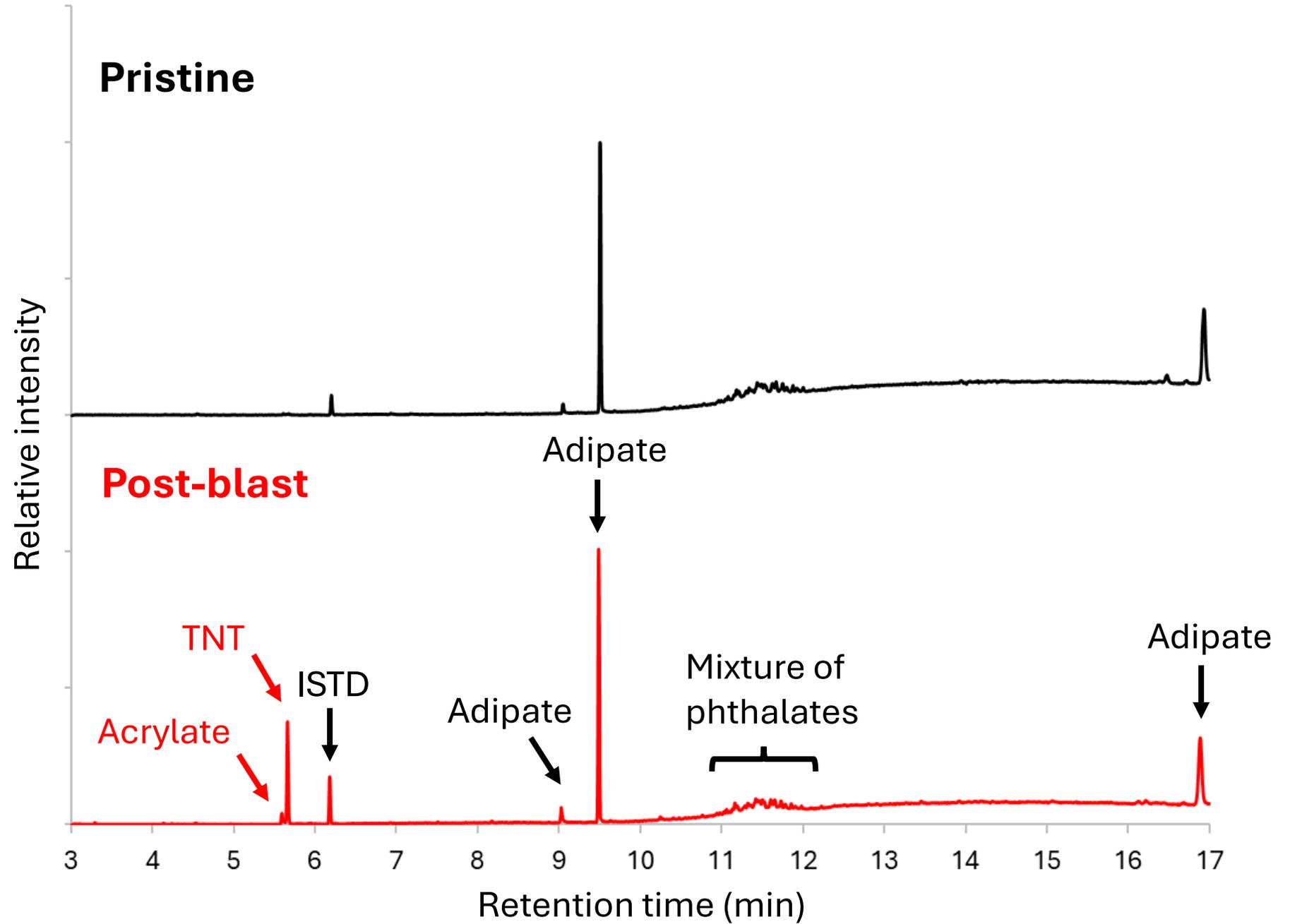
FTIR Spectroscopy



GCMS

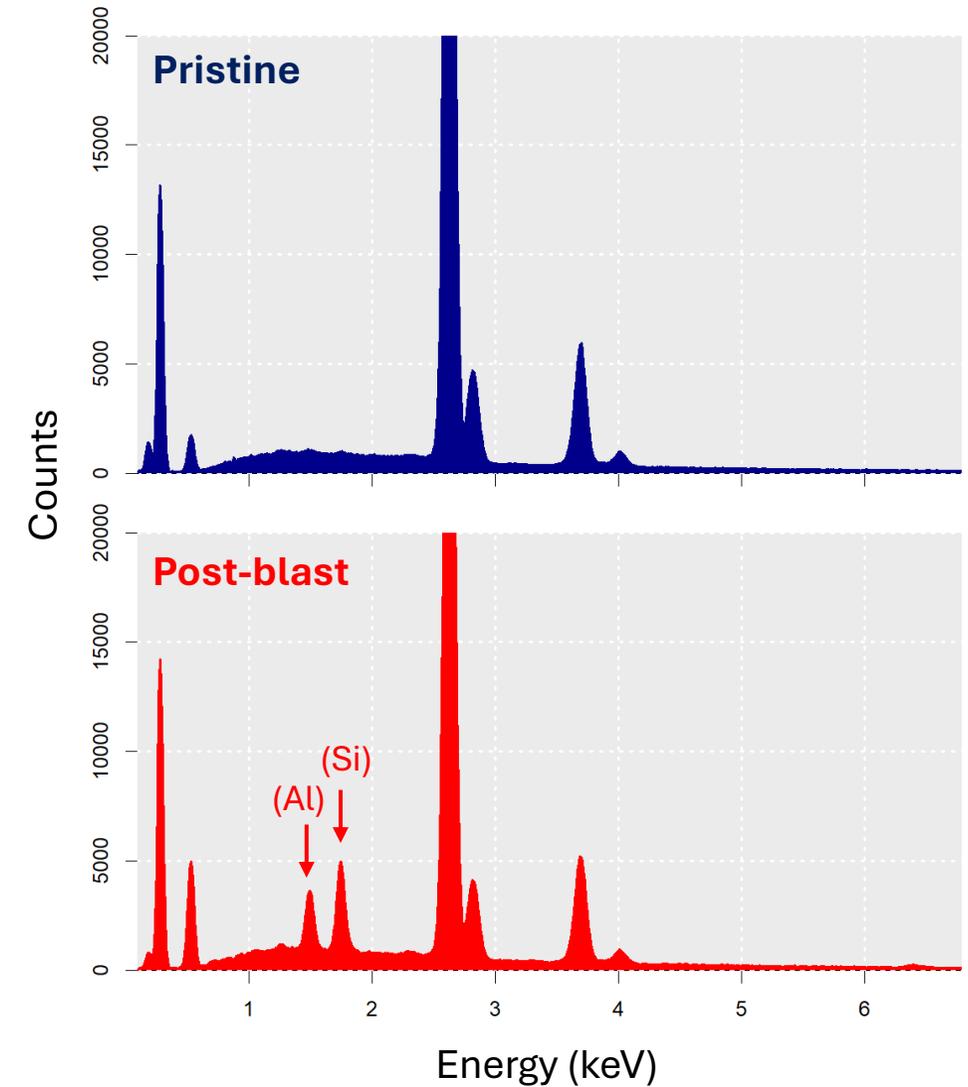


GCMS

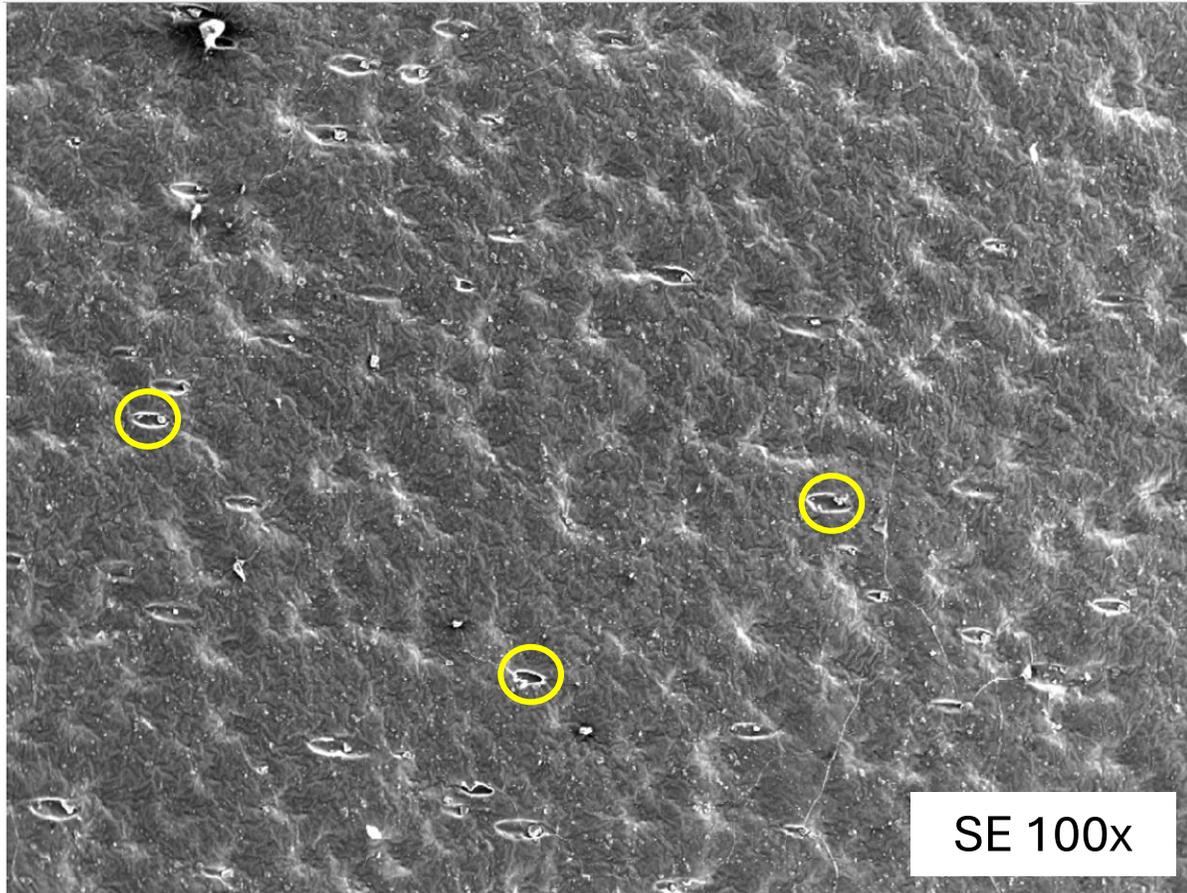


EDS Analysis

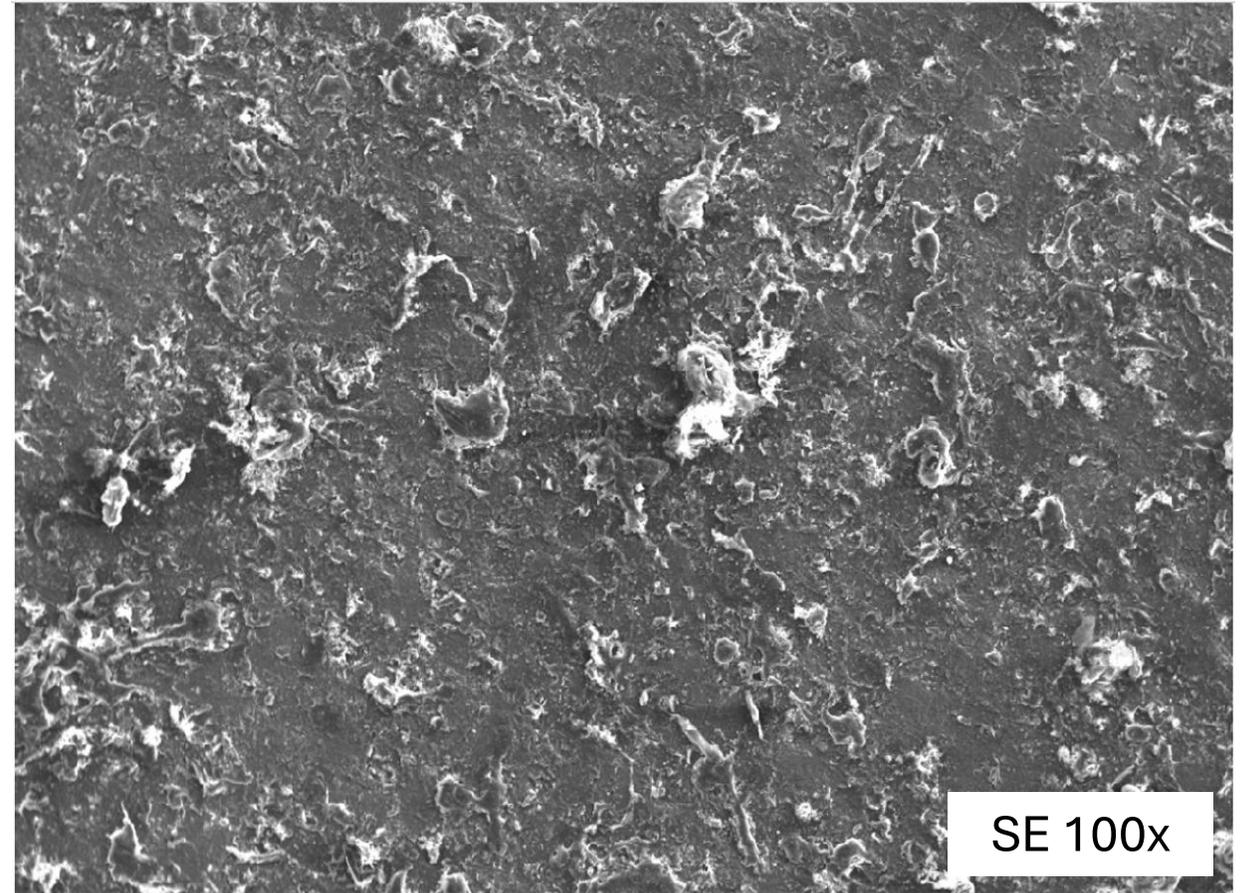
- Detection of additional elements:
 - (Al), (Si)
- Potential sources:
 - Additives
 - Extraneous material embedded in polymer
 - Damage to surface texture



Surface texture



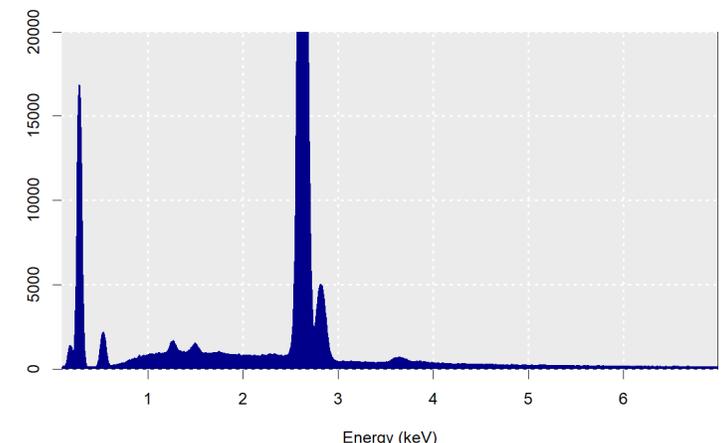
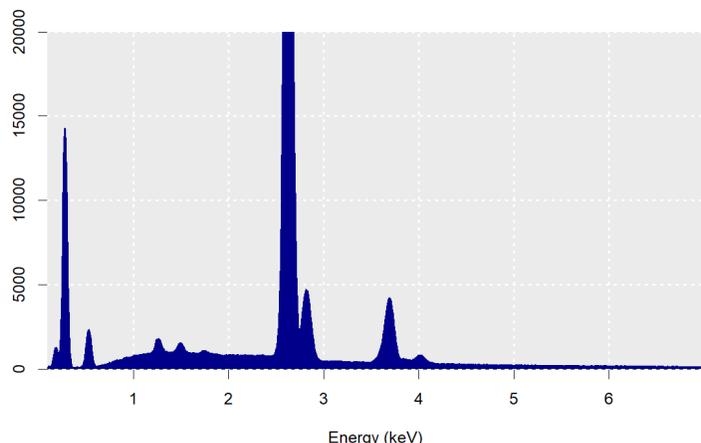
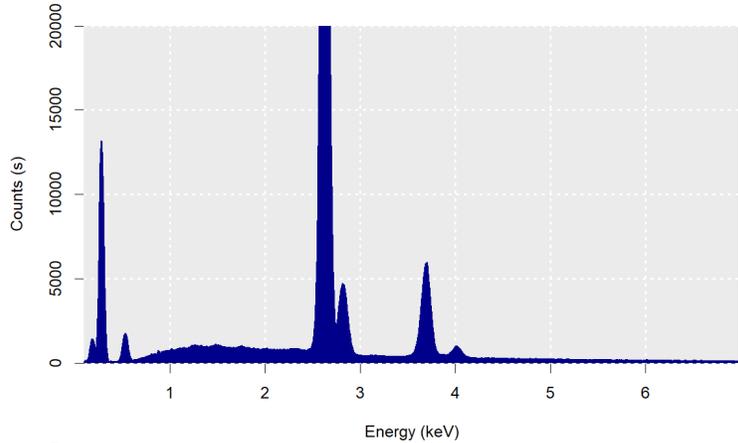
Pristine



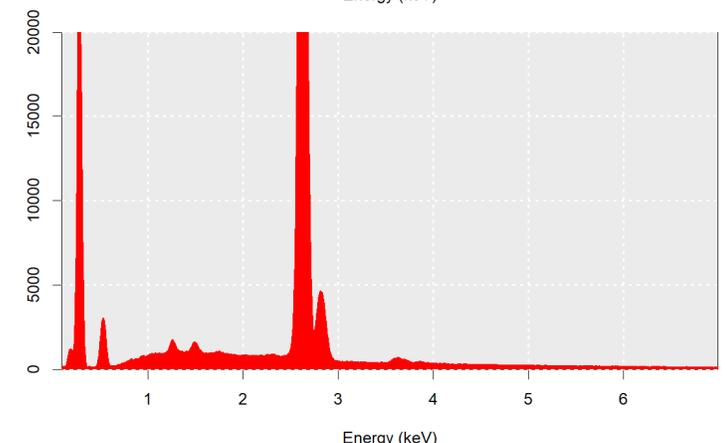
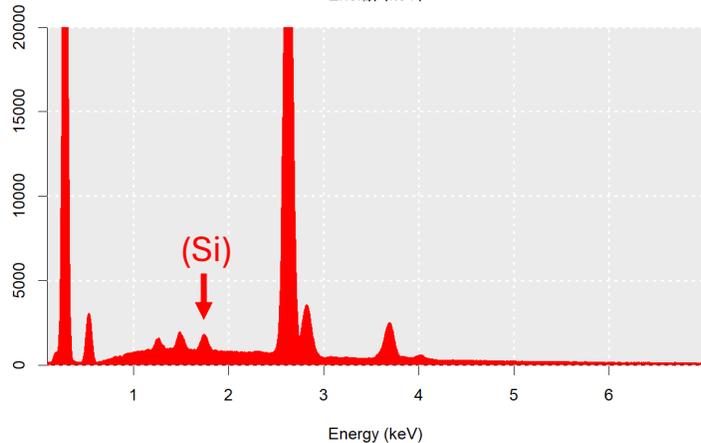
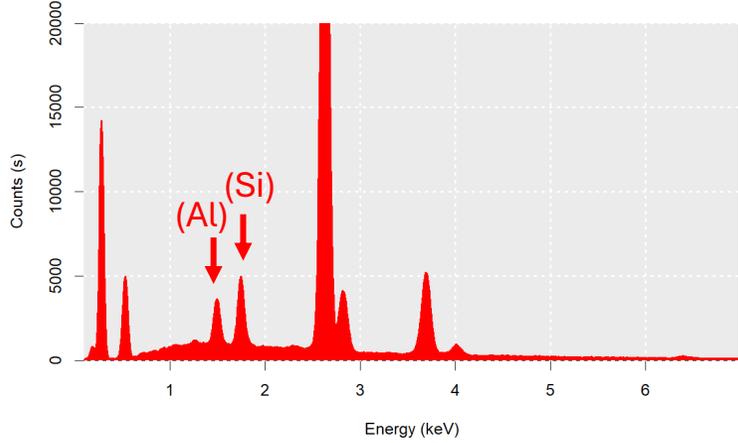
Post-blast

EDS Analysis

Pristine



Post-blast



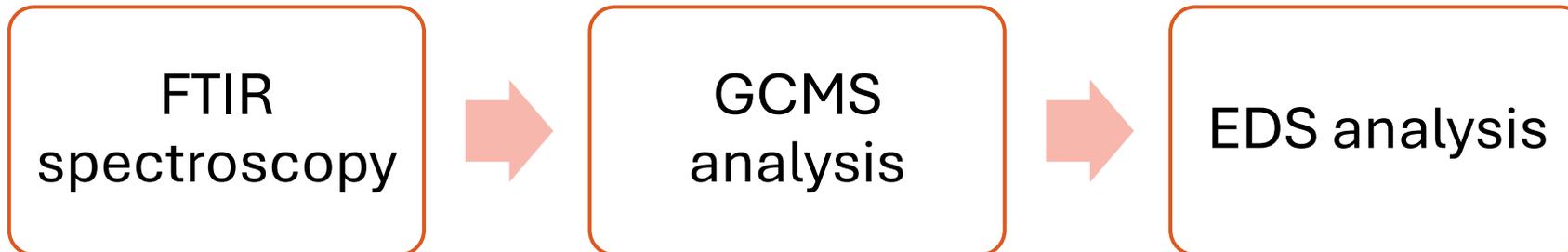
Conclusion

FTIR and EDS
More sensitive



GCMS
More robust

Recommendation for post-blast samples





Questions?

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