



## I Background and Introduction

Cigarette butts are the most littered item in the world, with estimates of 4+ trillion discarded annually

Cigarette butts are primarily composed of the filter, which is made of cellulose acetate (CA)

Public literature lacks comprehensive studies on the formulations of cellulose acetate fibers commonly found in cigarette filters

### Objectives:

- Create the foundation for investigating littered cigarette filters and fill the gap in literature on their physicochemical, thermomechanical, and dynamic properties
- Characterize the mechanical and time-dependent behavior of the filter microfibers

## II Sample Preparation



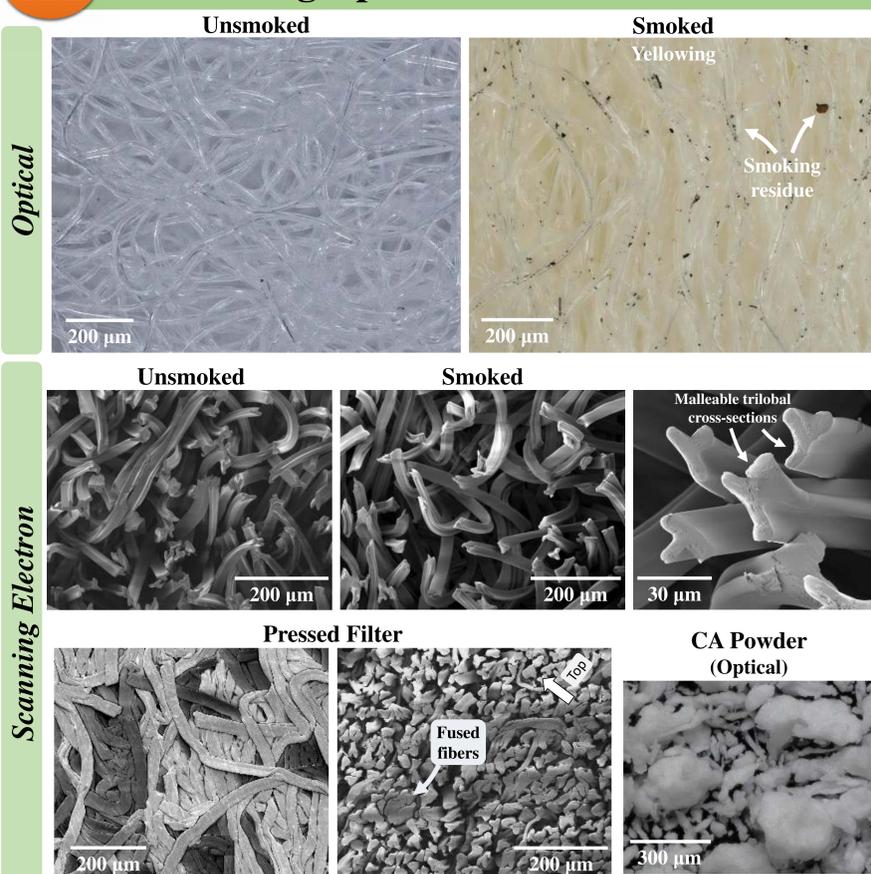
## Acknowledgements

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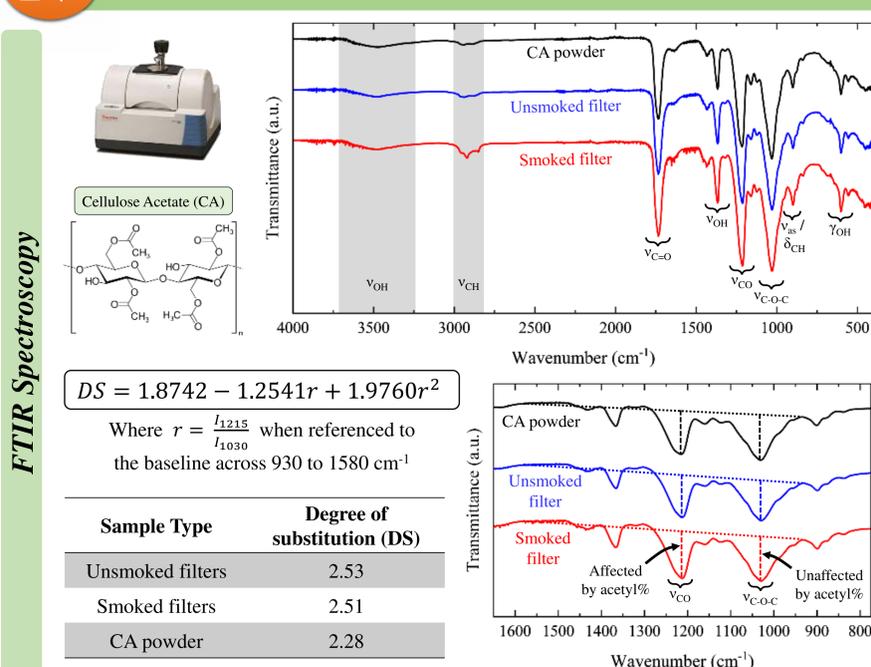
2nd Annual Research Symposium on Tobacco and the Environment

## III Micrographic Characterization



- Filters consist of a cylinder of tangled CA microfibers
- Tobacco residues (such as tar and ash) remain the filters after smoking, causing yellowing and leaving particles
- The smoking process does not change the morphology or geometry of the microfibers
- The pressing process affects the outer microfibers strongly, but the inner ones experience less deformation

## IV Chemical Characterization

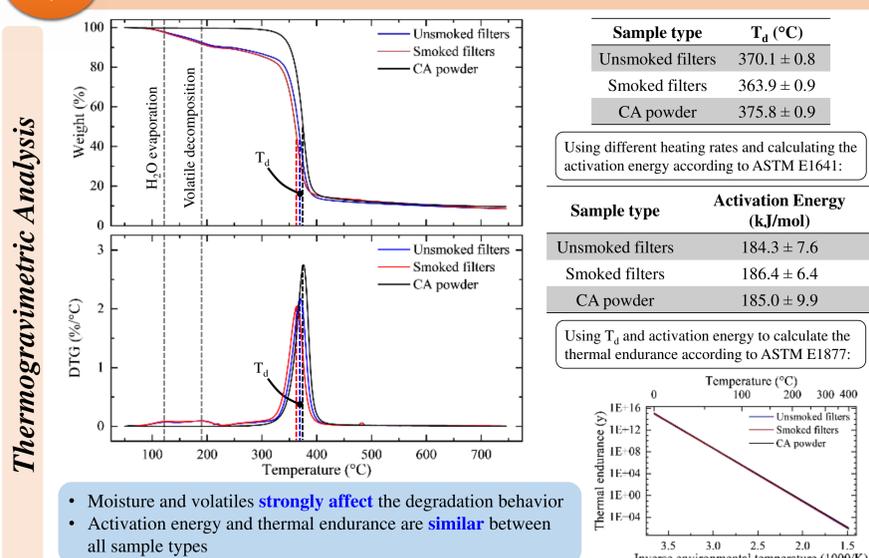


- Spectra differ due to plasticizers (fingerprint region valleys) and due to the smoking condition (ν<sub>CH</sub> band)
- Increase in DS (associated with reduced biodegradability) is due to change in morphology, processing conditions, and the presence of additives (primarily plasticizers)

## References

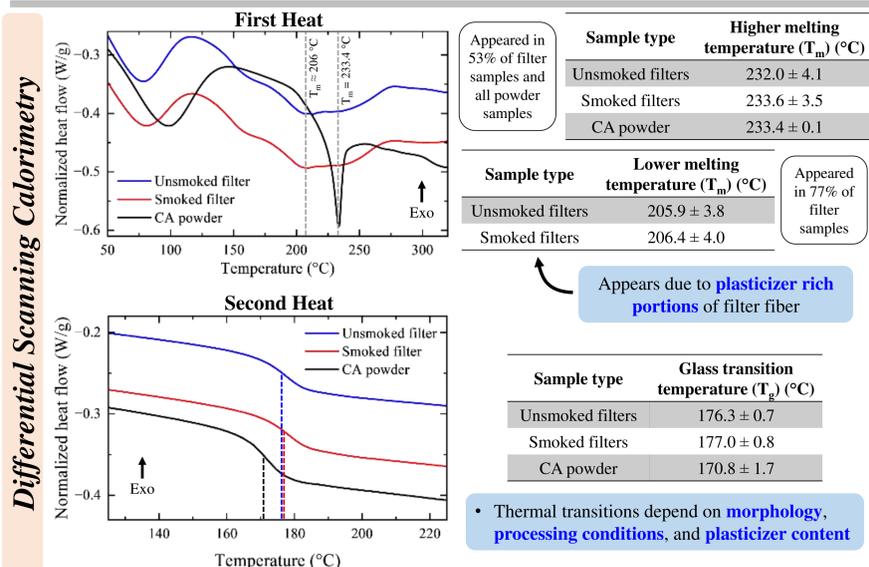
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## V Thermomechanical Characterization



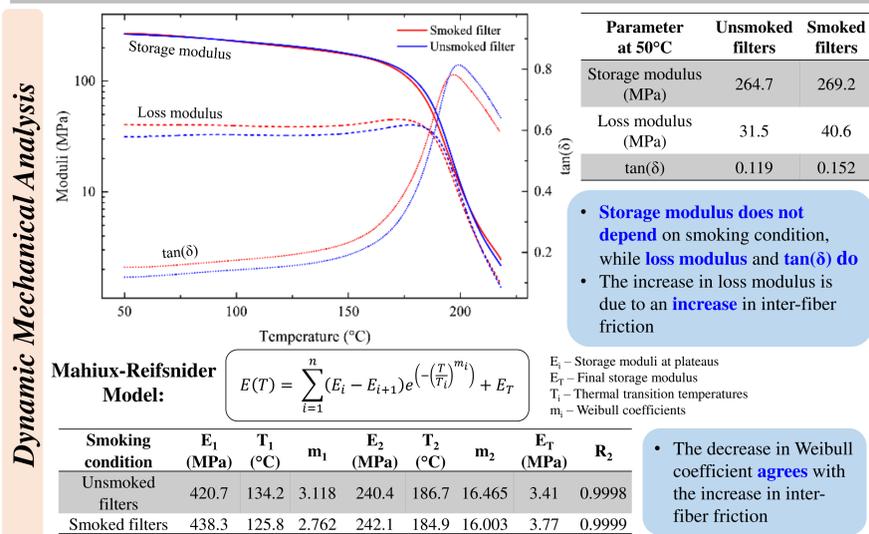
- Moisture and volatiles strongly affect the degradation behavior
- Activation energy and thermal endurance are similar between all sample types

## Differential Scanning Calorimetry



- Thermal transitions depend on morphology, processing conditions, and plasticizer content

## Dynamic Mechanical Analysis



## VI Conclusions

- 1 Formed a foundation for investigating the littered cigarette filters and filled the gap in the literature on the filter fiber properties
- 2 Characterized the mechanical and time-dependent behavior of the cigarette filter microfibers
- 3 The properties and behavior of cigarette filter microfibers are predominantly linked to processing conditions, not smoking condition

