

Moisture-swing polymer@textile composite membranes for CO₂ capture

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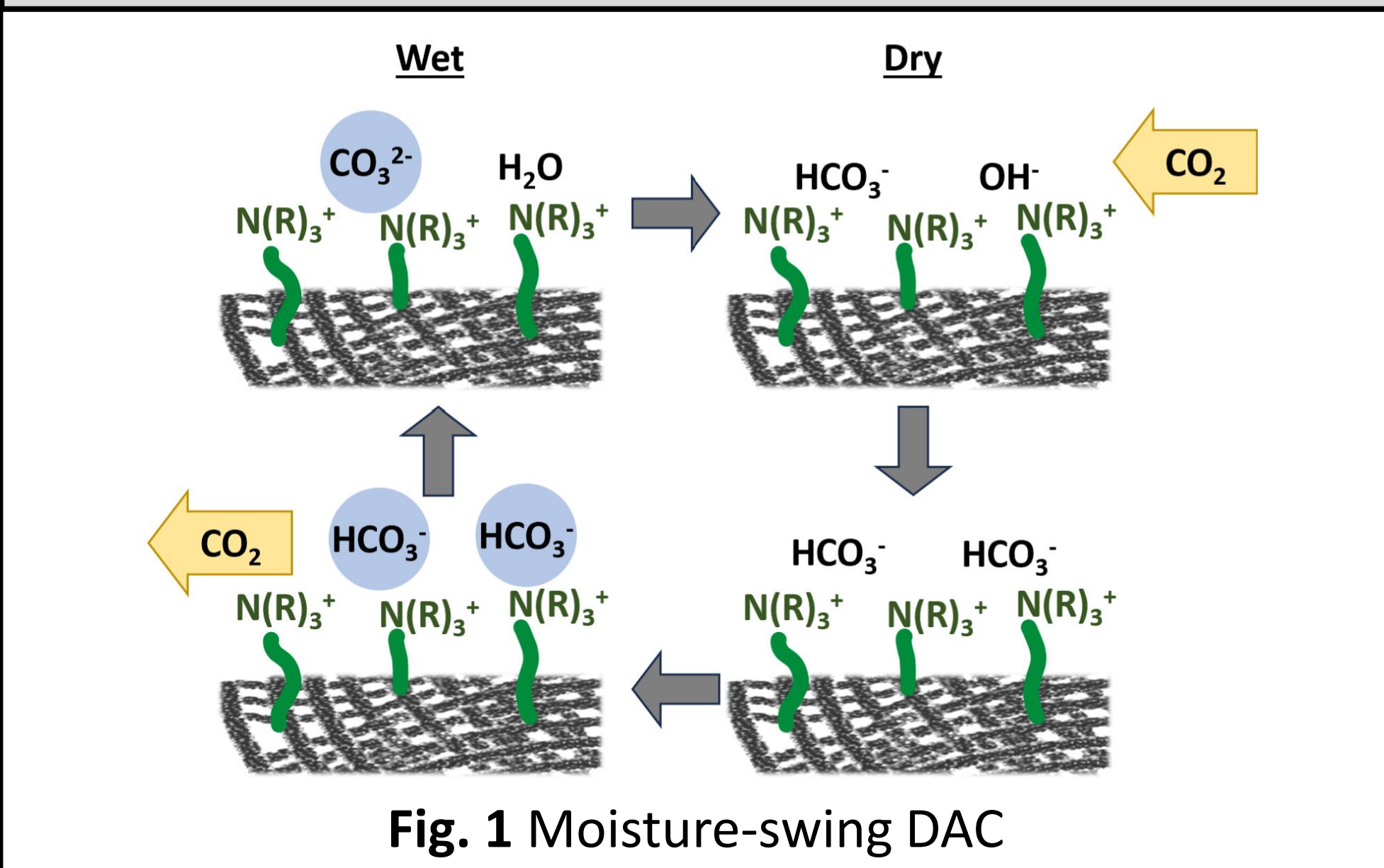
Motivation

- EPA estimates textiles made up 5.8% of municipal solid waste in 2018, of which only 14% was recycled.
- Moisture-swing Direct Air Capture (DAC) requires sorbents with long-term stability.

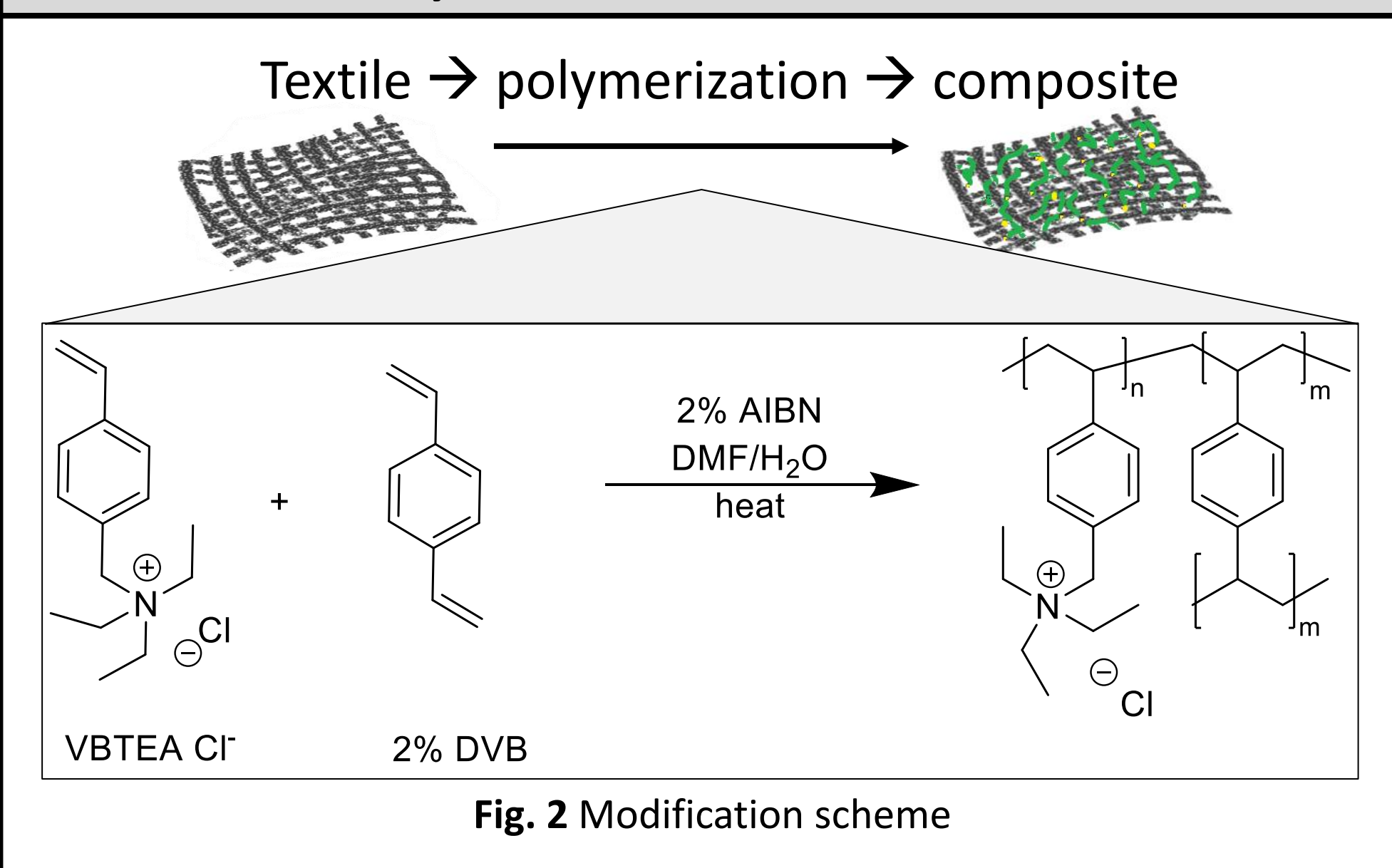
Objective

Synthesize and characterize polymer@textile composites to assess potential for moisture-swing DAC.

Moisture-swing DAC



Membrane synthesis



Modification results

Thickness	
Unmodified	0.180 mm
w/ VBTEA	0.199 mm
w/ VBTEA + DVB	0.246 mm

Fig. 3 SEM before and after modification

Acknowledgments

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Characterization

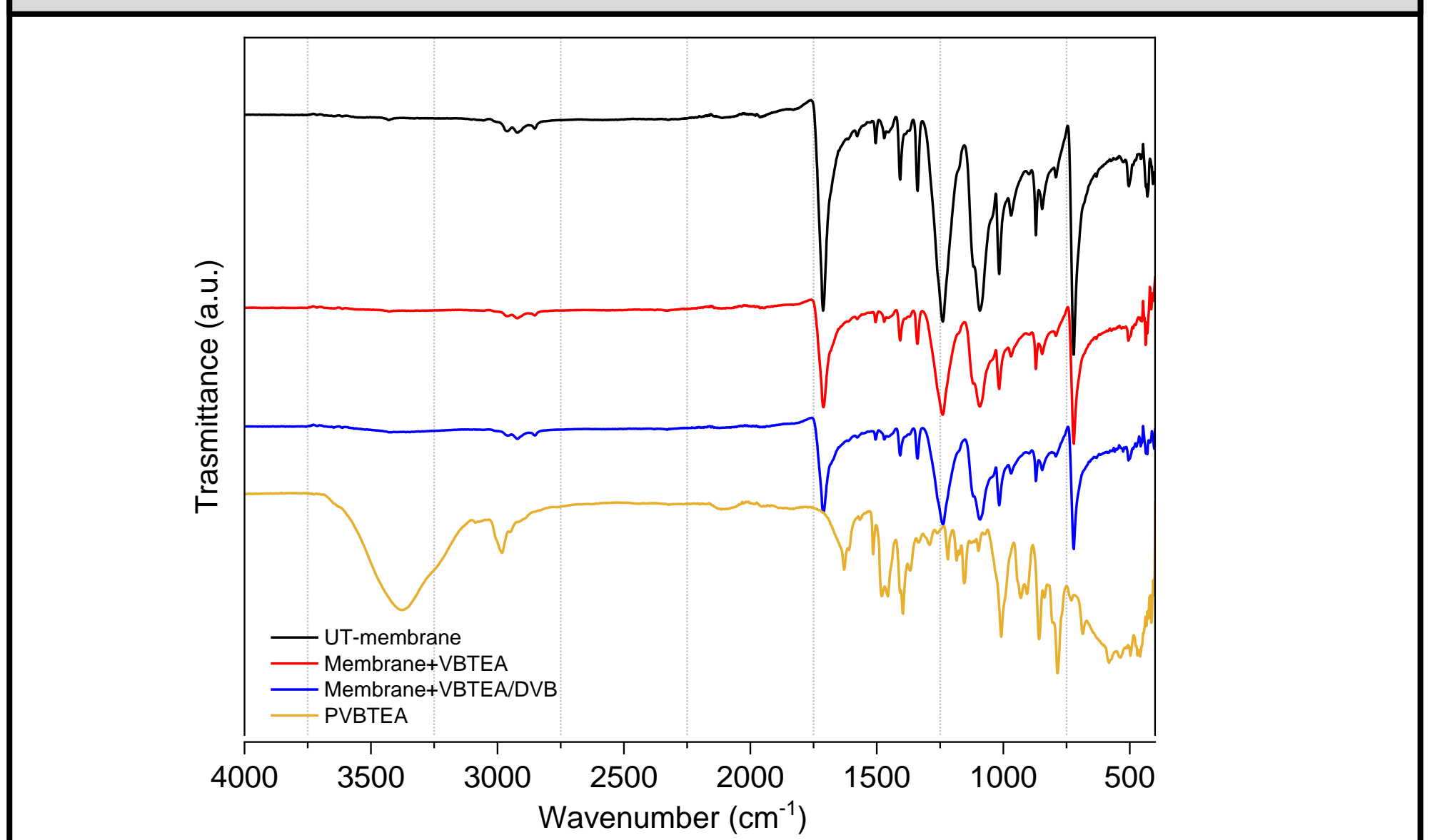
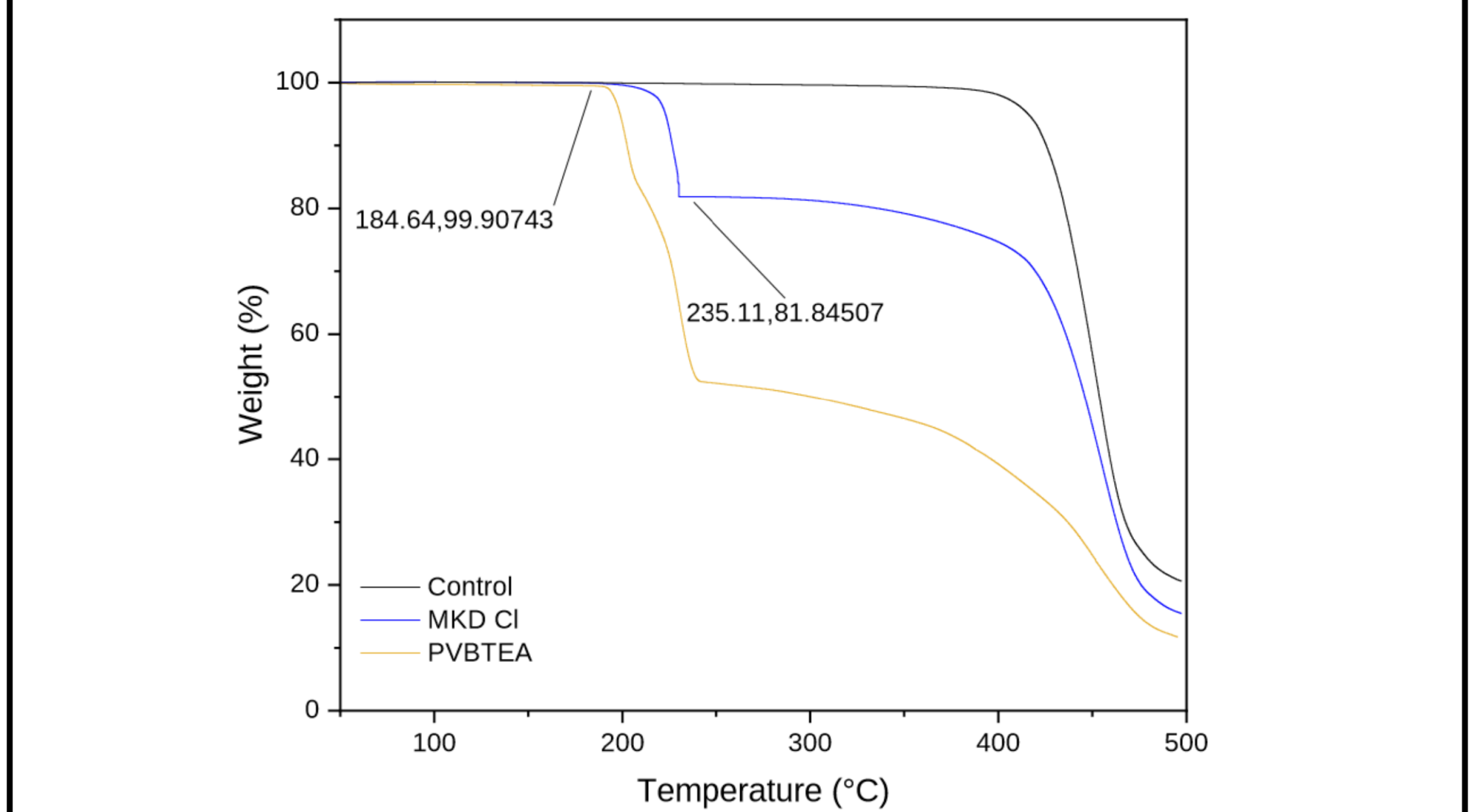
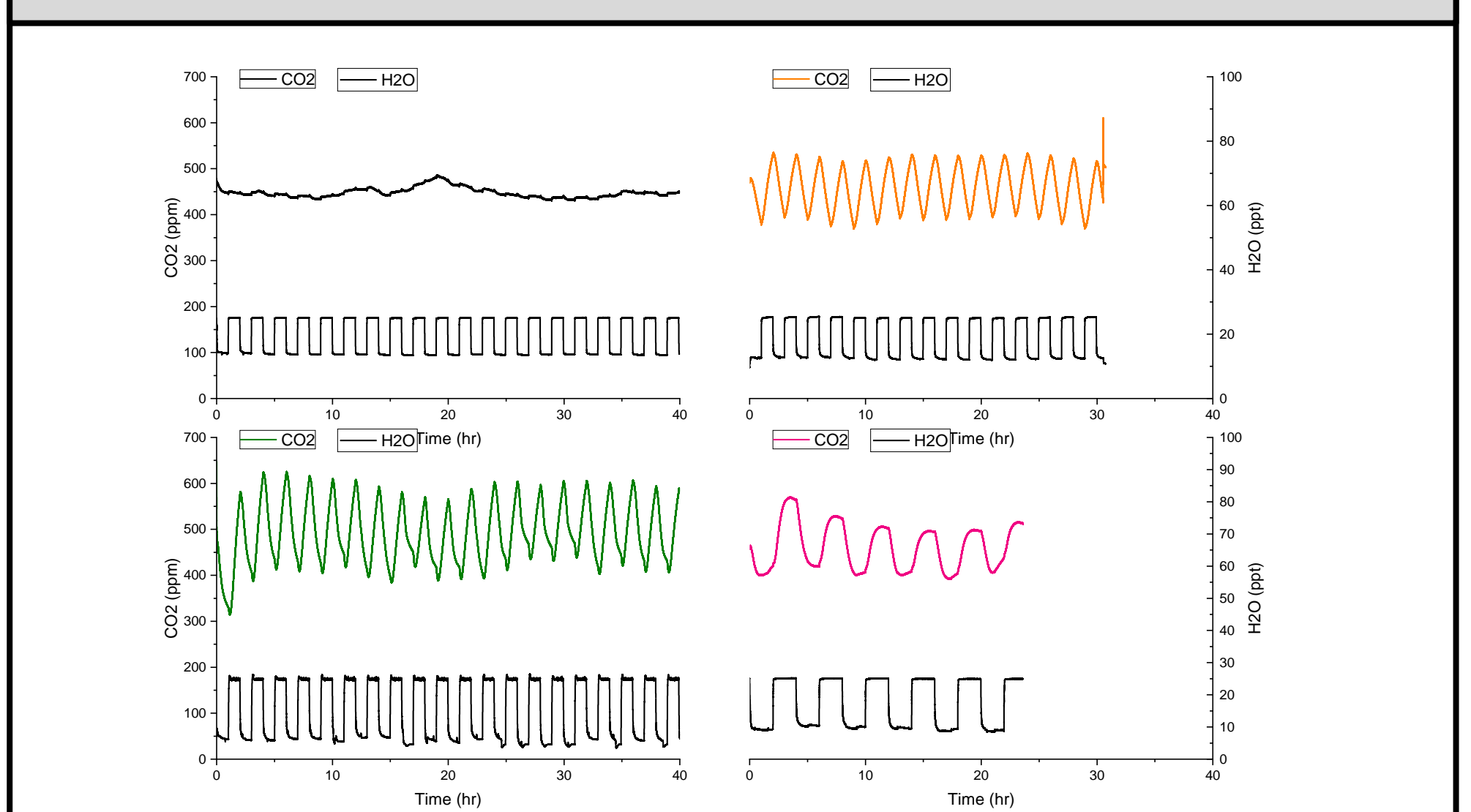


Fig. 4 FTIR spectra for unmodified textile, modified textile with and without crosslinking, and polymer



DAC results



Future work

- Develop modification procedure for various textile blends and dyed textiles.
- Investigate sources for textile waste.

Works Cited

Environ. Sci. Technol. **2011**, 45, 15, 6670.
Textiles: Material-Specific Data | US EPA. <https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/textiles-material-specific-data> (accessed 2023-11-02).