Aiden England 3MT Transcript | University of Guelph Campus Final 2020

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Title: Fashion Forward: A Process for Plant-Based Fabric

Transcript: I have two questions for you that are more related than you might think; are your actions helping to fight climate change? How many outfits did you buy last year? As a society we have become much more aware of the impacts of fossil fuels, however our demand for fast fashion has never been higher. The nylon and polyesters that are transformed into yoga pants, t-shirts and the like require 324 million barrels of oil every year. In fact, synthetic fiber production emits more greenhouse gases than international flights and maritime shipping combined. You may not think the majority of our clothing is made from oil but it's true.

Oil is like a blank building block. Over centuries of trial and error, chemists hare perfected the science of adding linking groups to oil to make synthetic fibres. Linking groups are like hands that allow slick oil molecules to connect and form fibre.

What if there was a greener way of making fabric? What if we could replace oil with plant waste? Plant biomass is an inexpensive and widely available sources of sugars which naturally contain lots of linking groups. By reversing the chemistry of adding linking groups to oil, we could remove the extra linking groups from sugars to make diols and fabric allowing us to make your favourite sweater from plant materials.

This is the incredible idea of biomass conversion. Biomass conversion has been heavily researched for decades, but one major barrier has kept the textile industry from embracing biomass. It turns out that the heat required to remove excess linking groups and produce diols, is also able to caramelize the sugars in the reaction. If you've ever burned sugar in a sauce pan you know this messy inconvenience all too well, now imagine the mess in a chemical reactor the size of a house. This means millions of dollars in downtime and a tough job of cleaning a viscous sludge from the equipment.

My research has the solution to this problem. My work combines inexpensive catalysts and hydrogen gas to remove excess linking groups and produce diols from sugars. But instead of returning thick brown solids that are challenging to work with, my work returns a clear liquid product. This innovative process reacts the linking groups of sugars with environmentally friendly acetic acid, in a process known as acetylation. Acetylation essentially closes the hands of linking groups, stopping the caramelization process while diols form. Once the diols have been made, they're deacetylated, allowing them to link together again and form fibers. This

technology could make biomass conversion industrially viable for the first time, reduce the fashion industries dependence on oil, and make your closet a whole lot greener.

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