



**Stitching Molecules Together from Renewable  
Building Blocks with Electricity**  
*Dr. Rachel Baker/Queen's University*  
*Thursday, September 07, 2023, 2:30pm*  
*Dupuis Hall, Room 217*

Chemical manufacturing relies on the use of fossil carbon feedstock as both energy and starting materials in the synthesis of useful molecules. One approach to greener manufacturing is the carbon capture and utilization strategy (CCU), where carbon dioxide is taken from industrial point sources and used as raw material for chemical production. Alternatively, longer carbon chains can be obtained from renewable sources such as biomass and upgraded to valuable chemical products. To add an extra degree of sustainability, these technologies can take advantage of electrochemistry – the direct application of electricity to a reaction as a source of energy – rather than relying on energy from burning fossil fuels. With an increasing percentage of electricity coming from renewable sources such as solar and wind, electrochemistry is becoming a viable option for chemical processes with a lower dependence on oil and gas.

(See slide 2)

This seminar will describe past and future efforts in using electrochemical methods for sustainable chemical production by making use of renewable materials such as carbon dioxide or alcohols derived from biomass. The products of these reactions find use in various industries such as pharmaceuticals, agrochemicals, fuels, materials, and more. Emphasis is placed on using kinetic and mechanistic studies to assist in process design and optimization. Future efforts involve the addition of a third element of sustainability, wherein sacrificial half-reactions are avoided, thus decreasing waste and increasing system efficiency. Ultimately, the methods described herein will reduce the carbon footprint of the chemical industry while maintaining production of valuable chemical goods.