

Chemical Engineering Colloquium

November 12, 2025

Goddard Hall, Room 227

12:00 PM – 1:00 PM

Engineering for Sustainability and Health: from Gas-Phase Bioreactors, to SCWO and Biomedical Devices

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In this seminar, a selection of research from my lab will be presented and discussed. For over three decades, we have investigated gas-phase bioreactors expanding their applications from odor control to biogas processing. Recent applications include upgrading biogas to renewable natural gas (i.e., biological conversion of CO₂ to methane), and microfluidic bioreactors for biodegradation of concentrates of VOCs.

Another recent interest of mine is novel thermal-chemical processing for concentrated wastes using supercritical water oxidation (SCWO). SCWO relies on the unique reactivity and transport properties of water above its critical point (374 °C and 220 bar). We built a unique 1 ton/day prototype for development at scale. I will discuss recent results on the treatment of biosolids and the destruction of emerging fluorinated contaminants (PFAS).

Lastly, I will briefly present an extension of my work in the field of biomedical devices. Our work on gas-liquid mass transfer led to collaborative research with medical doctors and the development of a novel device that can directly oxygenate the blood of patients suffering from acute respiratory distress syndrome (ARDS) which is a life-threatening condition. This example highlights the broad potential of the processes we study.



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