



**Wolfson Department of Chemical Engineering Seminar**  
**Lecture Hall 6, Wolfson Department of Chemical Engineering,**  
**Wednesday June 12<sup>th</sup> at 1:30pm**

## **Combustion Kinetics of Nitrogen-Based Alternative Fuels**

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Nitrogen-based fuels have been gaining traction as viable renewable energy storage media. International organizations such as the International Energy Agency (IEA), Committee on Climate Change (CCC) and others have recognized that such synthetic fuels offer stable long-term energy storage at a competitive cost with low emissions. Monofuels composed of urea/ammonia and ammonium nitrate (UAN/AAN) can be used for energy generation, providing a nitrogen-based alternative for monofuel applications. However, knowledge and understanding on UAN/AAN combustion is sorely lacking. In this seminar, we will explore the results of several works where the ignition and combustion characteristics of UAN and AAN were studied. Experimental results were measured employing either batch reaction systems for thermal autoignition studies, or flow reaction systems for continuous combustion studies. Water and inert gas additions delayed autoignition, while addition of surplus oxidizer promoted it. Higher reaction pressures promoted combustion as evidenced by higher product yields. Theoretical results were obtained using a gas-phase kinetics simulation software (CHEMKIN-PRO) employing optimized reaction mechanisms. Based on the agreement between experimental and simulation results, rate of production (ROP) and sensitivity analyses were applied to study the reaction pathways and rate determining steps (RDS). Conclusions derived from these results and their ramifications for other nitrogen-based fuel applications will be discussed.

Refreshments will be served at 1:15pm