הטכניון - מכון טכנולוגי לישראל

TECHNION - ISRAEL INSTITUTE OF TECHNOLOGY

הפקולטה להנדסה כימית
ע"ש וולפסון
The Wolfson Department of Chemical Engineering

Wolfson Department of Chemical Engineering Special Seminar

Lecture Hall 6, Wolfson Department of Chemical Engineering,

30th August, 2016 at 13:30

Bar Mosevitzky

Advisors: Prof. Gideon Grader & Dr Gennady Shter

Combustion Kinetic of Nitrogen-Based Alternative Fuels

Global energy requirements and utilization have been steadily increasing over the last few decades, as have regulations on emissions from conventional energy sources. These conditions have made the use of renewable energies a necessary ingredient in the long-term solution of this problem. However this track is complicated by the natural fluctuations in energy production that are associated with many renewable energy sources. Therefore, an energy carrier medium that allows storage of the collected intermittent renewable energy is needed. Given the advances in solar-based hydrogen generation, one possibility is conversion of the hydrogen into a stable fuel that can be used upon demand. Most commonly these potential fuels are carbon-based (i.e. hydrocarbons & alcohols), but nitrogen-based fuels are another option.

Two such fuels are aqueous solutions of urea/ammonium nitrate (UAN) and of ammonium hydroxide/ammonium nitrate (AAN). As monofuels, these fuels do not require an external oxidizer (i.e. air/O_2) since they contain both the reducing and oxidizing agents. In my research, a combined simulation and experimental study of both monofuels was performed. A previously developed simulation model for UAN combustion was refined and applied to reproduce experimental results from a PFR type reactor using CHEMKIN-PRO, a kinetic gas-phase simulation software. Furthermore, an experimental investigation of the ignition behavior of UAN and AAN was performed. A thermal analyzer was used to study the influence of composition and diluent pressure on the monofuels' auto-ignition and their thermal behavior in general. These experiements were then simulated to examine the ability of the previously developed UAN combuation mechanism in predicting the auto-iginition temperature of AAN.

Refreshments will be served at 13:15