Want to do *Rocket Science*? Here’s your chance!

Looking for motivated students to work on hybrid rocket propellants

Rockets work by combustion which requires a fuel and an oxidizer. Solid and liquid rockets utilize fuel and oxidizer in the same phase (solid and liquid respectively). Hybrid rockets— the focus of our research— use fuels in the solid & oxidizers in the liquid phase. Hybrids are safe, cheap, allow thrust control and have a simpler design. However, without ignition of the propellant, our rocket’s not going anywhere, and that’s a challenge for hybrids. Hybrid ignition is plagued with problems such as delayed ignition and heavier motor weight to accommodate separate igniter systems. *Our research therefore focuses on utilizing an energetic but safe propellant combinations that reacts exothermically and ignites rapidly, thereby potentially overcoming ignition problems in hybrids.*

To overcome issues associated with hybrid rocket ignition, we’ll utilize **hypergolic ignition**— ignition upon contact without the need for heat/spark. $\text{H}_2\text{O}_2$ will be the oxidizer and **polyethylene** mixed with $\text{NaBH}_4$ will be the fuel. **Utilizing high-speed, infrared and hyper-spectral imaging techniques** our research will seek to gain an in-depth understanding of hypergolic ignition involving the aforementioned propellant combination. **This can pave the way for safer and cheaper hybrid rockets— that run on plastic!**

### Research Objectives

1. **Reduce Ignition Delay of** chosen hypergolic propellant
2. **Determine rate of relative heat release** associated with hypergolic ignition
3. **Determine important chemical species** involved in hypergolic ignition of chosen propellant

**HYPERGOLIC IGNITION IN ACTION**

Interested in joining the Combustion and Diagnostics Group? Email: joseph.lef@technion.ac.il