## **Controllable Combustion of Metal Fuels for Space Power Systems**



Evgeny Shafirovich (PI) The University of Texas at El Paso

Vladimir Volpert (Co-I/Institutional PI) Alvin Bayliss (Co-I) Northwestern University

Northwestern

## Approach

- Kinetic studies of Li and Mg reactions with O<sub>2</sub>, CO<sub>2</sub>, and O<sub>2</sub>/CO<sub>2</sub> mixtures
- Combustion experiments with Li and Mg fuels in O<sub>2</sub>, CO<sub>2</sub>, and O<sub>2</sub>/CO<sub>2</sub> environments
- **Modeling** of combustion wave propagation over metal fuel at coflow and counterflow feed of oxidizer

## **Research Objectives**

- Innovation: Controllable use of the high energetic potential of metal/perchlorate mixtures in a system with a solid fuel oxygen generator and a metal combustor
  - Objective: Characteristics and mechanisms of combustion wave propagation over Li and Mg fuels in O<sub>2</sub> and CO<sub>2</sub> environments
  - Start TRL: 1-2
  - End TRL: 3

## **Potential Impact**

- Specific energy: by several times higher than for the best batteries
- Optional addition of *in situ* CO<sub>2</sub> further increases specific energy
- High energy density
- Non-toxic, solid components
- Unlimited lifetime



Metal Combustor Coupled with O<sub>2</sub> Generator