

Advantages of an LTA-SOFC

- **Extremely fuel flexible:**
 - Hydrogen, syngas, natural gas
 - Biodiesel, ethanol
 - Coal, JP-8, biomass, plastics
- **More tolerant to fuel contaminants**
- **Can run directly on liquid, solid fuels without gasification**
- **Can run for short periods in "battery mode", oxidizing the tin**
- **Anode can be circulated and refined while running**

LTA-SOFC Research at NETL

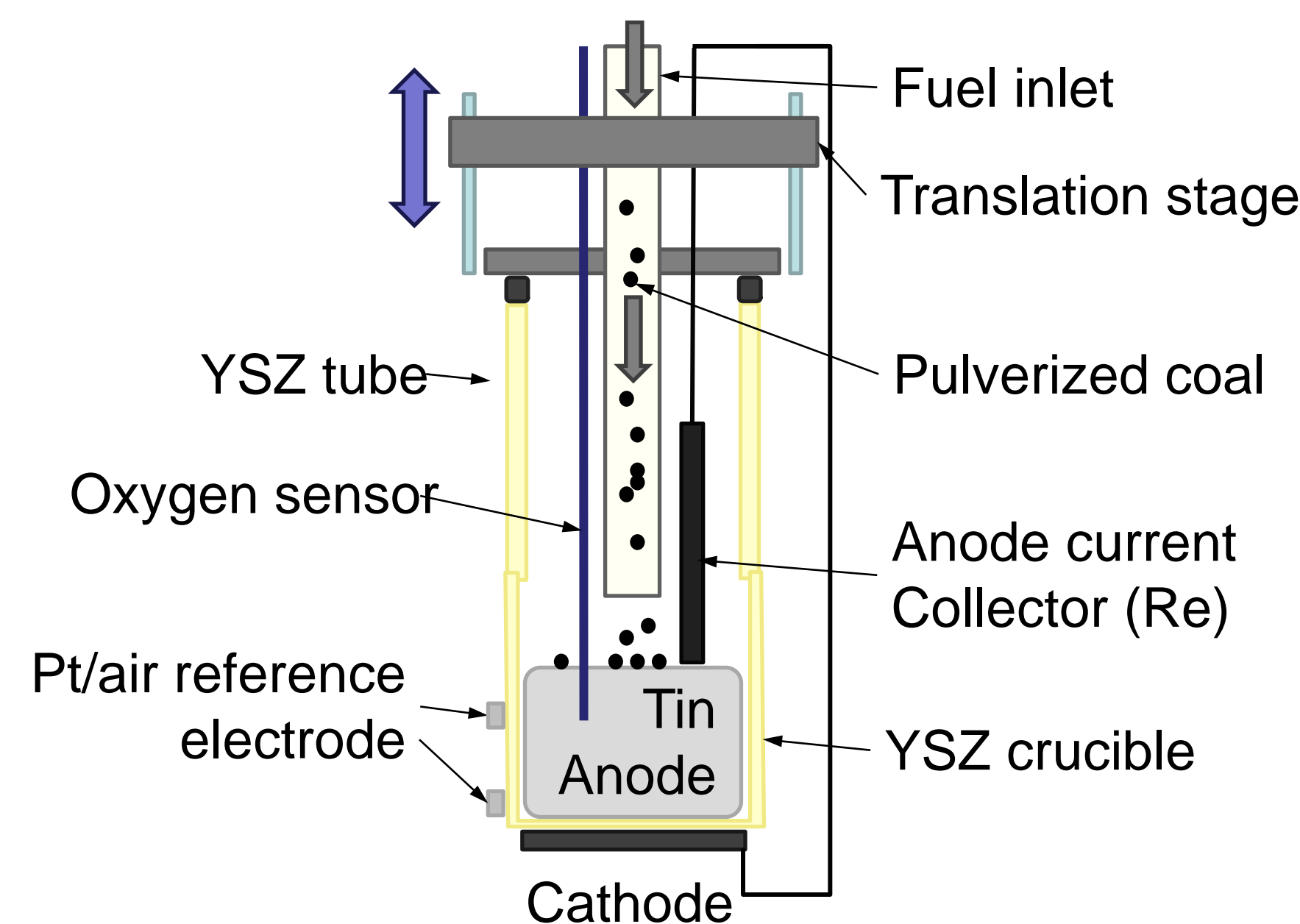
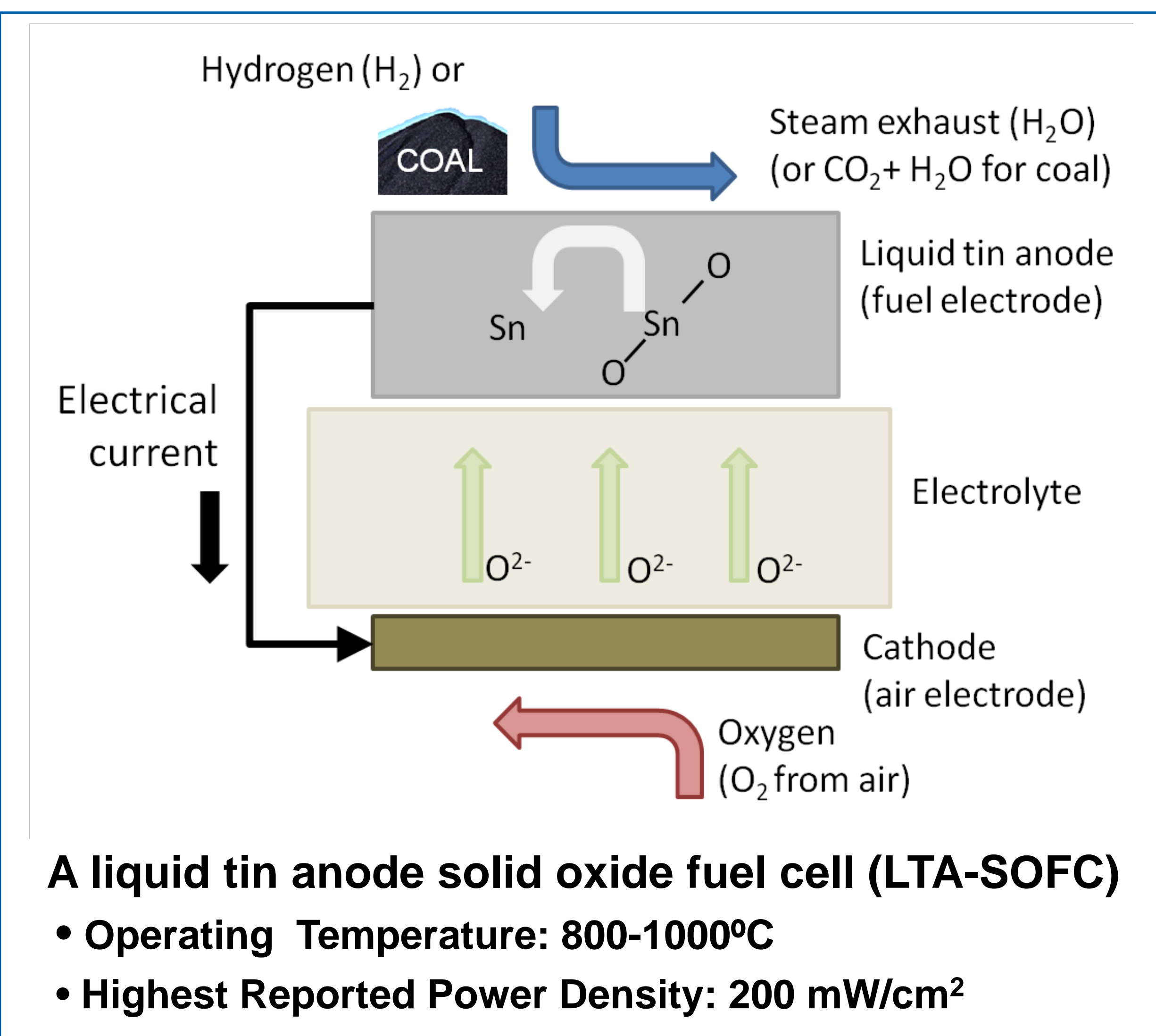
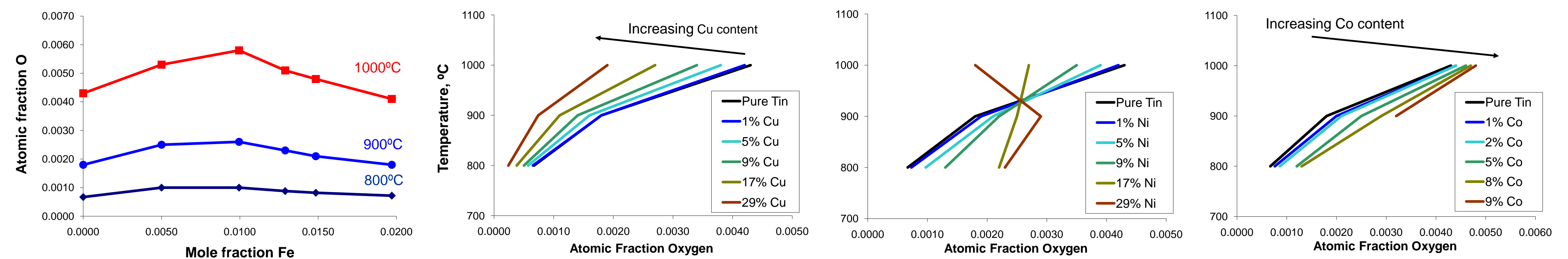
Objectives

- **Measure oxygen diffusion rate through liquid metal anodes**
- **Determine O₂, H₂ solubility limits of liquid metal anodes**
- **Apply kinetic parameters to model**
- **Determine performance limitations of liquid metal anodes**
- **Modify tin composition and design to improve performance**

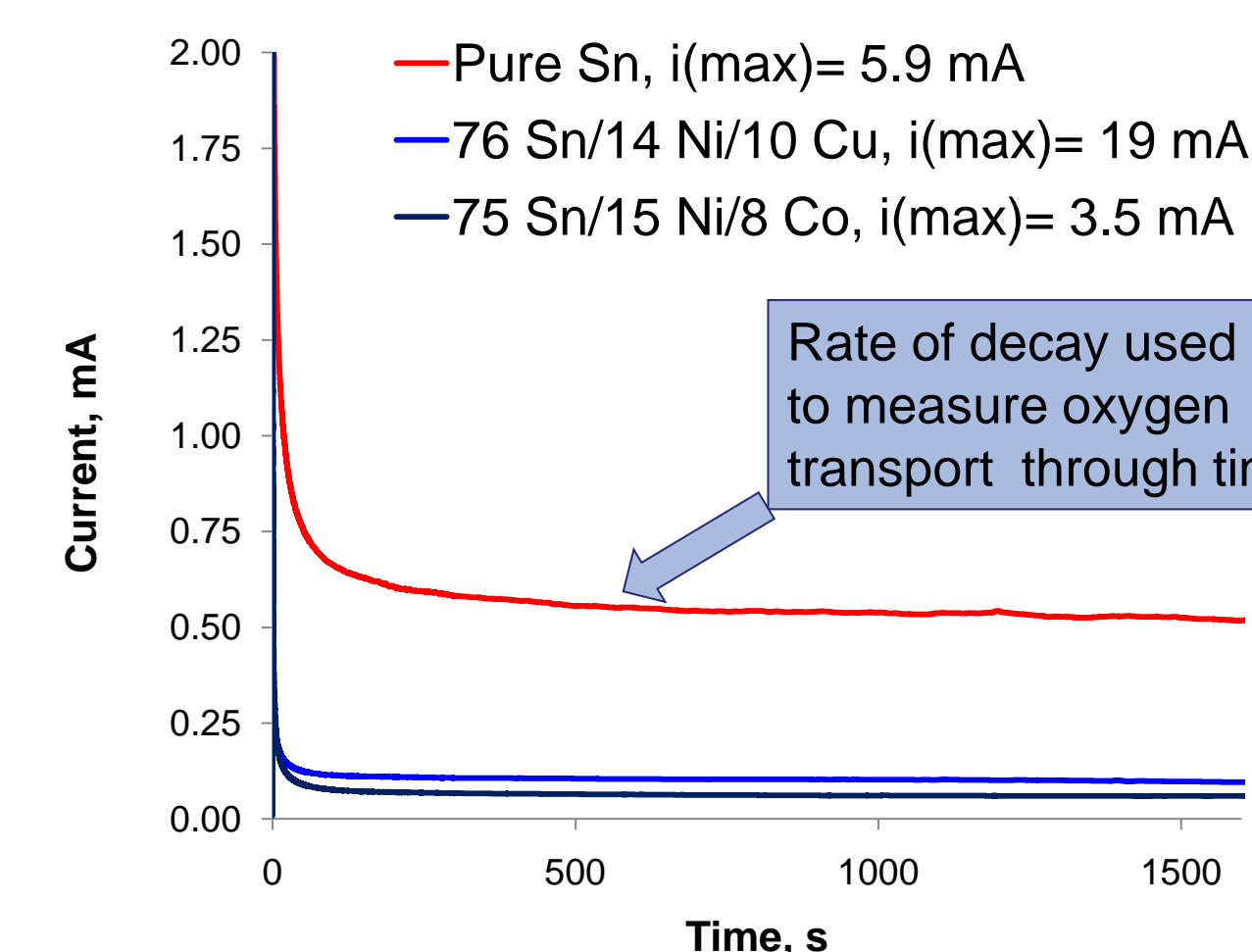


Test Sample Installed in Furnace

Effect of alloying elements on oxygen content in liquid tin alloy



Schematic of LTA-SOFC Test Sample



Current response of metal anodes to 20 mV step in potential away from OCV at 900°C under humidified H₂. Alloy compositions were chosen using FactSage™ thermodynamic software based on predicted c_O values.

Candidate alloy characteristics

- Single liquid phase
- Low vapor pressure
- No slag formers
- Doesn't react with fuel or electrolyte
- Wets electrolyte
- Faster oxygen transport than tin
 - Balance of D_O, c_O

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