NASA SBIR/STTR Success Story

University of Puerto Rico at Mayaguez
TDA Research Inc.

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About Us

• Research Institution: University of Puerto Rico at Mayaguez
• Small Business Partner: TDA Research Inc.
• Innovation: Highly Efficient Closed-Loop CO₂ Removal System for Deep-Space ECLSS
• Problem Addressed: Life Support System for Long Term Space Exploration
Phase I STTR Work

- Deep space missions beyond the Low Earth Orbit require closed-loop livings systems to reduce the logistic burden
- TDA Research Inc. (TDA) in collaboration with University of Puerto Rico – Mayaguez (UPRM) is developing a highly efficient CO$_2$ sorbent wheel system for closed loop space craft cabin air re-vitalization during deep space missions
- Sorbent consists of a Sr-exchanged SAPO-34 zeolite developed by University of Puerto Rico – Mayaguez (UPRM) with previous research NASA University Research Centers (URC) funding
- The goal of the Phase I work is to
  1. Scale-up the sorbent production
  2. demonstrate high working capacity at low regeneration temperatures
  3. Demonstrate long life of the Sr-SAPO-34 sorbent
  4. Complete engineering design and analysis
TDA’s System

• TDA has previously built a similar flight qualified sorbent wheel system for humidity removal and is being used in ISS with the amine swing bed (CAMRAS)

• TDA’s CO₂ sorbent system can be used individually to remove both humidity and CO₂ or can be used to remove CO₂ only downstream of a separate humidity wheel

The advantages of TDA’s Sorbent Wheel system are

● Eliminates the valves and uses structured sorbent
● Eliminates sorbent attrition due to lower temperature regeneration and the use of structured sorbents

TDA’s flight qualified desiccant wheel in ISS
Phase I Accomplishments

• We showed that preparing the Sr-SAPO-34 using microwave synthesis not only increased the working capacity of the sorbent, but also significantly reduced the synthesis time (by twenty fold); this will be critical when we scale-up the batch size

• We carried out a 170+ cycle fixed bed test, which showed that the sorbent was stable through multiple adsorption/ desorption cycles

• TDA’s sorbent wheel based system can recover 4 kg/day of high purity CO₂
  • Estimated overall system weight of 138 lbs (62.6 kg)
  • Estimated dimensions of 46” H x 36” L x 18” D
  • Compared to 382 lbs (173.3 kg) for the 4BMS system
Phase I Results: System Design

**System Design and Engineering Analysis (TDA)**

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Contact Information

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