

*Name: Michelle Iannantuono*

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**College of Charleston**

Chemistry/Bachelors of Science/2013

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### **Methane Purification for Oxygen Recovery**

For long-term space missions, maximized resource recovery is essential to sustain the supplies of astronauts. A system for recovering oxygen from carbon dioxide (CO<sub>2</sub>) is the Sabatier Development Unit (SDU). Methane (CH<sub>4</sub>) forms the secondary product of the system and contains unreacted CO<sub>2</sub> and water, which must be removed in order to maximize oxygen recovery. For this purpose, the Methane Purification Assembly (MePA) is designed with a bed of 13X zeolite, a commercial sorbent with an affinity for these two byproducts, and silica, which absorbs moisture from air. We packed the MePA main bed with over 1000 grams of 13X and 200 grams of silica. A cooling loop is connected to the MePA allowing the system to be cooled during adsorption cycles. The sorbent bed can also be heated to desorb the zeolite, allowing the assembly to be reused. The cooling system and zeolite bed are connected with pre-fabricated duct work and the entire MePA is insulated. Completion of the fabrication, assembly, integration and testing of the MePA while integrated with state-of-the-art CO<sub>2</sub> reduction hardware marks a first for NASA technology development. Integrated testing results of the system provide crucial data for the development of future life support systems.

### **Research and Experience**

- **Marshall Space Flight Center**, Summer Intern, Summer 2012  
Environmental Control and Life Support Systems Branch: built and integrated the Methane Purification Assembly (MePA) into a test stand; wrote and presented test and checkout procedures required to run testing; performed several modules of testing with fabricated assembly.
- **NASA Space Mission Design Project**, Co-Investigator, Charleston, SC, August 2011 - April 2012  
College of Charleston: A geology major, a computer science major and I designed a science mission for a hypothetical Mercury lander. We collaborated with engineering students at the University of Alabama Huntsville and competed against other teams in our class.
- **Medical University of South Carolina**, Summer Intern, Charleston, SC, Summer 2011  
Cancer Vaccine Lab: Aided the lab as a summer intern, helping them perform cancer research using flow cytometry and fluorescent antibodies. I also redesigned our mouse inventory, attended joint lab meetings, and presented results to my peers.

### **Memberships and Activities**

- American Chemical Society (2011 - now)
- Campus TV; recruited and managed a crew of 12+ people to produce a web series (2010)
- FIRST Robotics and BAE Systems; mentor for the Hanahan High FIRST Robotics team (2009)

### **Honors, Awards**

- Palmetto Fellows Scholar (2009 - now)
- College of Charleston Presidential scholar (2009 - now)