

# CT Scans help understand reaction pathways for Hydrogen Fuel Cells (Contract #: 0847464; Rowan University)

- **Outcome:**

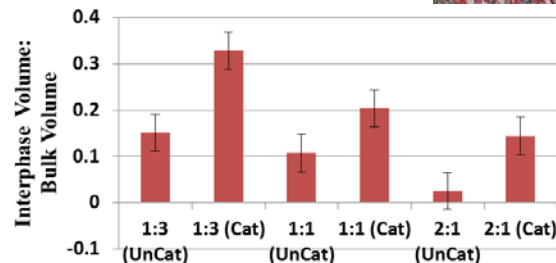
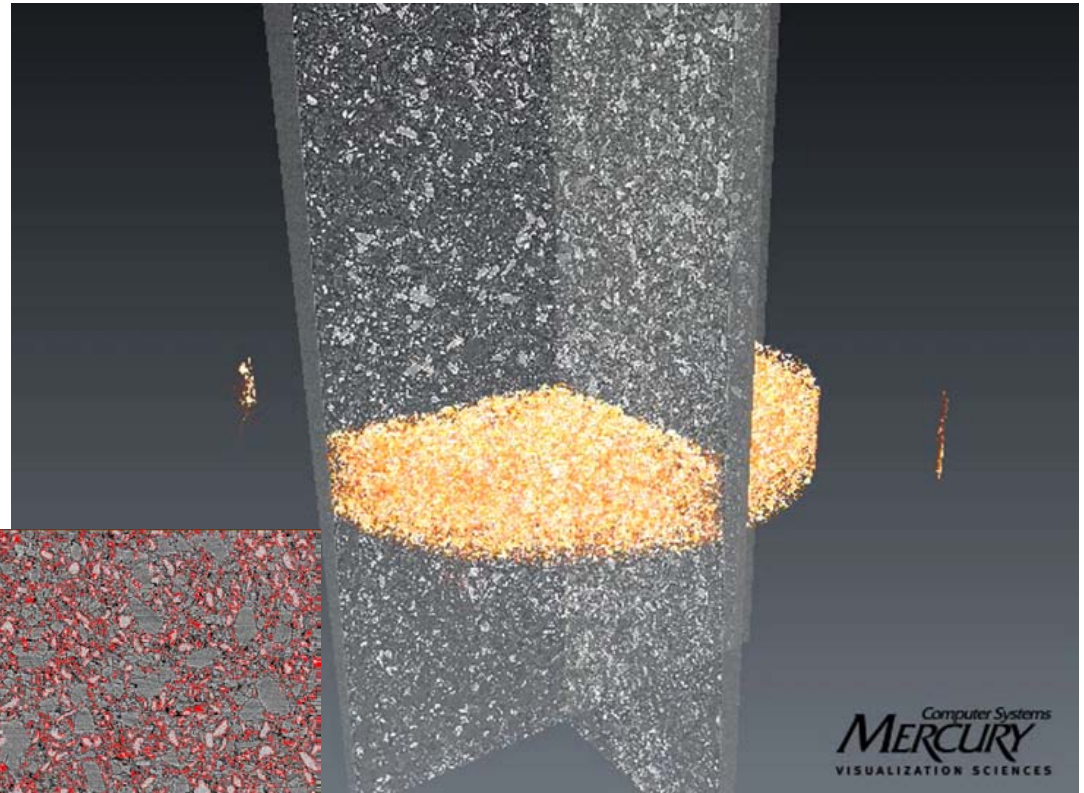
- X-rays computed tomography (XCT) is used to determine shape, size, and interfacial area between two reacting species, LiBH<sub>4</sub> (light grey shading) and MgH<sub>2</sub> (dark grey shading).

- **Impact/Benefits:**

- Hydrides are used to deliver hydrogen to fuel cells. Overcoming the challenge of carrying hydrogen gas, in a stable form, on-board vehicles could revolutionize the ways in which we fuel up our automobile tanks.

- **Explanation:**

- One of the most promising hydride systems discovered to date (in terms of temperature and pressure of H<sub>2</sub> gas release) is a mixture of two compounds: MgH<sub>2</sub> and LiBH<sub>4</sub>. The interfacial area determine the speed of hydrogen gas release (or kinetics) and the extent of reaction occurring. Images like the ones shown will ultimately lead to the design of more suitable reaction microstructures.



**LiBH<sub>4</sub>:MgH<sub>2</sub> prepared in a 1:3 molar ratio and imaged at 2BM beamline of the Advanced Photon Source.**

Dobbins T., NaraseGowda S., Butler L., “Study of the Morphological Changes in MgH<sub>2</sub> Destablized LiBH<sub>4</sub> Systems Using Computed X-ray Microtomography”, *Journal of Alloys and Compounds*, submitted.

# Hydrogen for Fuel Cells from NanoMushrooms Made of $\text{NaAlH}_4$ (Contract #: 0847464; Rowan University)

- **Outcome:**

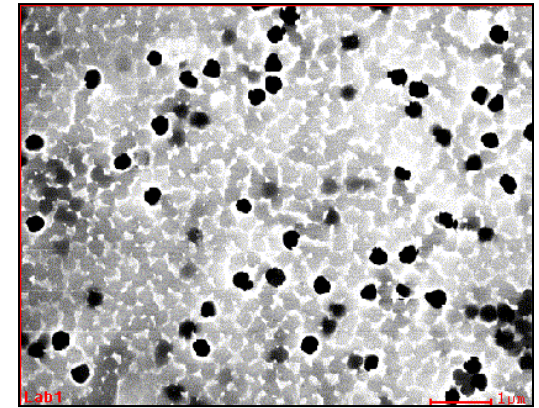
- X-rays are used to determine shape and size of nanoconfined hydrides by measuring mass fractal dimension (D). Mass fractal dimension determines the mass of an object by the formula:  $M \sim R^D$

- **Impact/Benefits:**

- Hydrides are used to deliver hydrogen for fuel cells for automotive applications. The shape (or morphology of those hydrides) determine the speed of hydrogen gas delivery (or kinetics).

- **Explanation:**

- Nanostructuring is a key strategy in improving speed of hydrogen desorption reaction. Studying those nanostructures is made possible by synchrotron x-ray studies performed at the Advanced Photon Source.

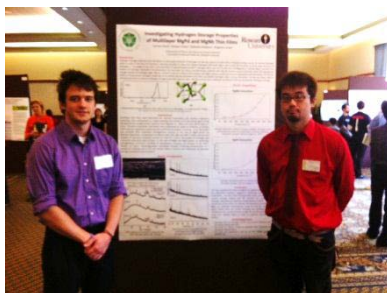


***NaAlH<sub>4</sub> Confined in 200 nm Porous Alumina***



<http://www.travelblog.org/Photos/795745>

# Undergraduate Student Exchange with Hokkaido University (Lab of Dr. Shigehito Isobe) on Hydrogen Storage Materials (Contract #: 0847464; Rowan University)



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## Rowan University physics major Zachary Buck will study in Japan

Published: Sunday, January 22, 2012, 4:00 AM



By Jessica Driscoll/ Gloucester County Times

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Zachary Buck, a 22-year-old physics major from Washington Township, will be the first student to participate in Rowan University's new exchange program in Japan

Zachary Buck considers himself an adventurous person and loves to travel, so when he heard about Rowan University's new exchange program with Hokkaido University in Japan, it caught his attention.

An old professor told him what the program was about and, a few months later, the 22-year-old physics major from Washington Township is set to embark on a semester in Sapporo.

"I will be assisting with research in hydrogen storage properties of nanostructured carbon and lithium-based materials under the supervision of Dr. Shigehito Isobe," said Buck, who will be at Hokkaido from the end of February through mid-April. "I know its kind of a mouthful, and I still have a lot to learn about it, but the practical

applications that come out of it will be used in many energy storage devices and, perhaps, aid in the new generation of the automobile."

Home > Gloucester County > Education

## Rowan University is hosting an exchange student from Japan

Published: Monday, March 26, 2012, 6:00 AM



By Jessica Driscoll/ Gloucester County Times

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Shotaro Chiba, of Sapporo, Japan, works with the X-ray

GLASSBORO — Shotaro Chiba is enjoying his time at Rowan University and his first visit to the United States.

"This device is better than the one at my university," said Chiba, 22 — of Sapporo, Japan — as he analyzed samples created by **Rowan student Zachary Buck** in the X-ray reflectivity machine on Friday.

Chiba is living in a Rowan Boulevard apartment and researching at the university through April 23 as part of Rowan University's new exchange program with Hokkaido University in Japan.

Rowan student Buck, of Washington Township, is conducting simultaneous research at Hokkaido through the beginning of April.

Both students will present at Rowan's STEM event on April 20.

Rowan Assistant Professor Tabbetha Dobbins said there's a nice exchange

### Gloucester County Times (N.J.) Articles:

1. [http://www.nj.com/gloucester-county/index.ssf/2012/03/rowan\\_university\\_is\\_hosting\\_an.html](http://www.nj.com/gloucester-county/index.ssf/2012/03/rowan_university_is_hosting_an.html)
2. [http://www.nj.com/gloucester-county/index.ssf/2012/01/rowan\\_university\\_physics\\_major.html](http://www.nj.com/gloucester-county/index.ssf/2012/01/rowan_university_physics_major.html)