ISEC: Mid July, 2021 Update:

Funding/Management:
We are grateful for the recent increase in funding to allow stipends to continue for Martin (through December, 2021) and Olivia (through March 2022).

Stage II funding ($4000) has been sent to three collaborators:
Alexis (Virginia/Carribean),
Emmanuel (Ghana), and
Salma (Togo).

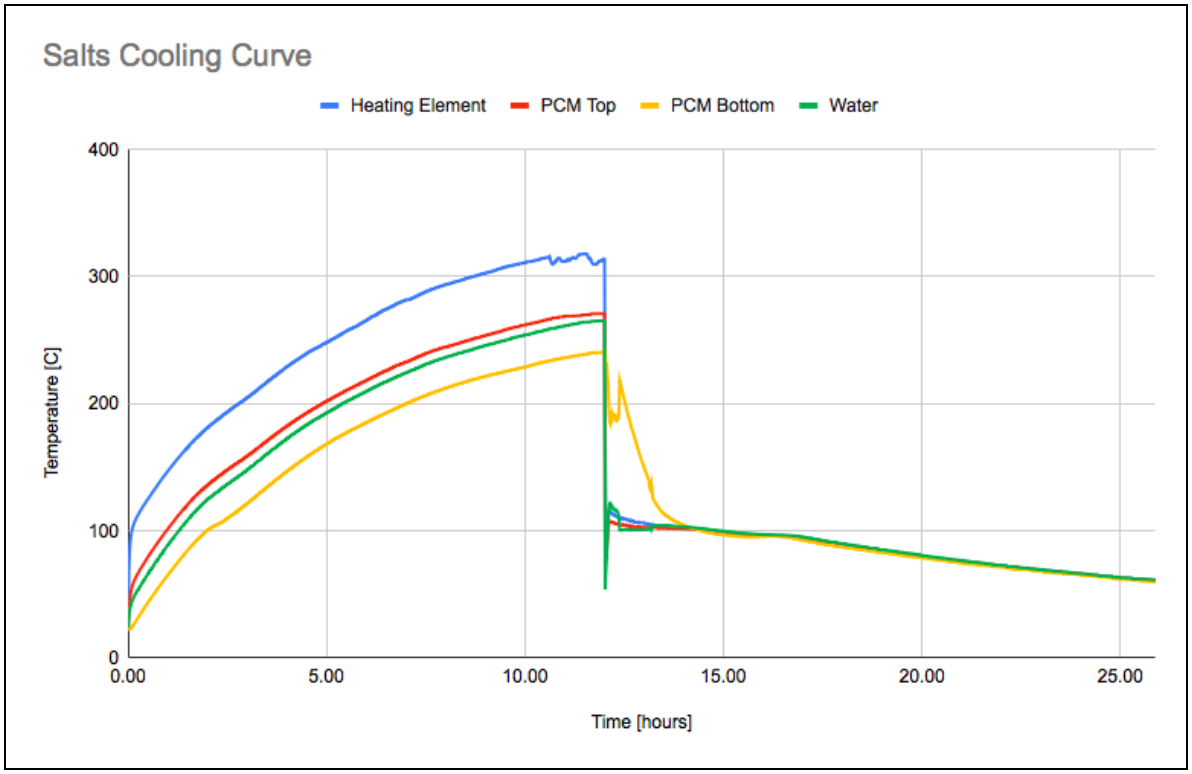
SuperGroup meetings:
We have continued meetings every Thursday at 10 AM (California Time). Photographs documenting the meetings are at the bottom of our website:
http://sharedcurriculum.peteschwartz.net/solar-electric-cooking/

Sourcing Parts:
Martin is organizing partners to deliver solar panels inexpensively from India to African Partners. Modeled after Alexis imported $4000 of solar panels with his stage II funding for $0.38/W delivered to Jamaica (US retail is about $1/W).
Andrew Perez (Cal Poly student) is looking into USB charging ports, for which collaborators have expressed great interest.

Laboratory Progress:
We are working toward making ISEC higher temperature, more thermally robust, and more desirable as a consumer good.

Liquid Salts.
We are communicating with Matt Alonso (Sun Buckets PhD thesis) and we received two Sun Buckets, one of which is of compromised condition. We also made two ISECs with the potassium/sodium nitrate salt mixture.


Picture of Sun Bucket in insulation connected to a 420 Watt solar panel.



The nitrate salt mixture in the ISEC PCA from our publication was melted. At about 12 hours, water was added and boiled for about 4 hours.

Insulation Materials:
In the “Outer ISEC”: We are adding rockwool and perlite to the original fiberglass insulation because of better structural support and human-friendly textures. The upper “countertop” surface is a challenge because it needs to be insulating, high temperature, and easy to clean. Welding Blankets are a thick fiberglass fabric and seem to work well.

Double Cooker:
Traditional stoves are often double stoves. Alternatively, one insulated pot can be used to keep food warm while the other is used for cooking. We have finished the required measurements and insulation and plan to cover the surface using a welding blanket and aluminum sheeting.

Vacuum Flasks:

We have been testing multiple vacuum-sealed commercial vessels for their insulation integrity. This has been done by heating up the 3.2 kg aluminum puck mentioned in the section below with an electric hotplate to approximately 325 ℃ and placing it within the vacuum-container to cool. The aluminum puck was insulated within the inner chamber above and below with rockwool insulation. One container, the Buffalo brand, was at least 100 ℃ for approximately 18 hours. A figure below shows this data collection, along with another test on a Stanley brand container.

Photo of two brands of vacuum-sealed vessels tested so far.

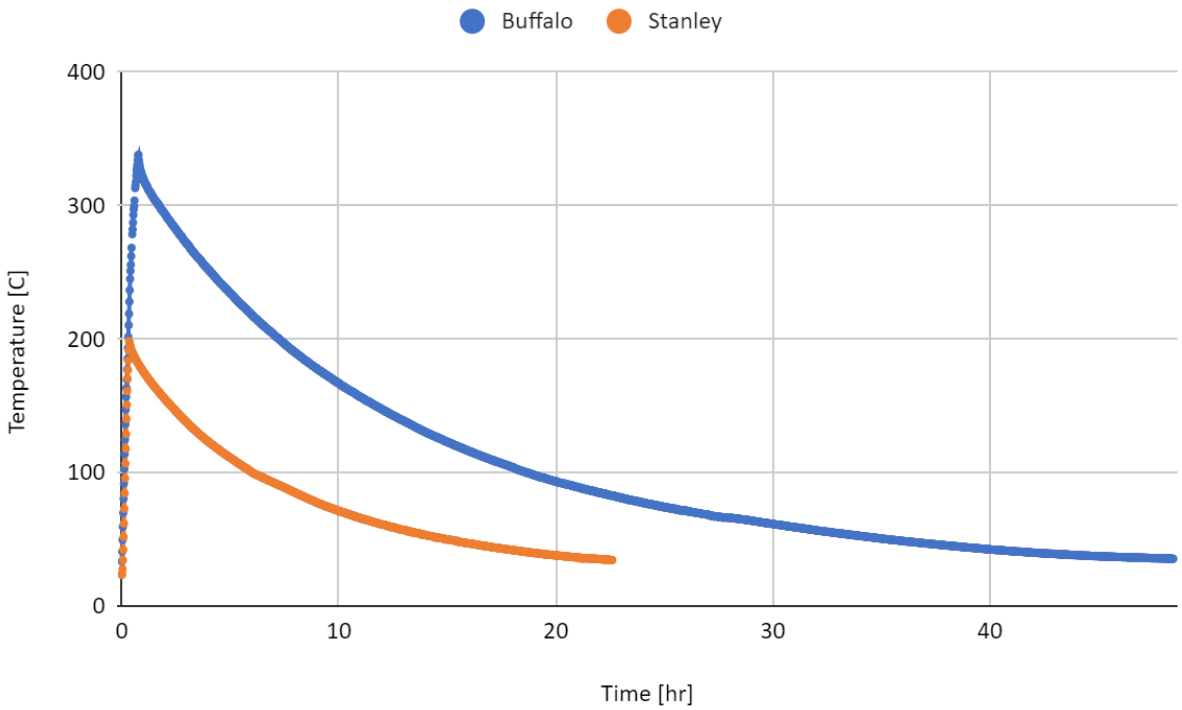


Figure of cooling curves for both vacuum insulated containers pictured above.

Aluminum Puck: While most of our work is centered on melting nitrate salts, we also have a 3.2 kg aluminum puck we heat to 340 ℃. One collaborator (Deepak, India) is also experimenting with solar aluminum thermal storage.

Cooking: We cook lunch using the ISECs daily and eat together. Students explore more dishes (usually with Ghanaian influence). We usually use two ISECs to cook and feed 8-10 people.

Picture of our research group and delicious tomato stew, chicken curry and rice meal.


Traditional Ghanaian meal with collard greens (left) and veggie medley with beans (right)


Tomato and Potato Stew over rice is one of our favorite dishes to make.