



Colorado Science and Engineering Fair

2025 Individual Project Abstract Form

Please print 2 copies of the completed form. Sign both copies, keep 1 for your notebook and submit 1 copy to your Regional Fair Director with your other paperwork.

Title of Project: A Better Solar Panel: Can Coating Solar Panels Improve Their Efficiency?

Finalist's Name: Ingram Olson

School and City: Telluride Intermediate School

Sponsor's Name: Gin Randolph

Category: Energy

Division: Junior (grades 6 - 8)

Abstract (250 words or less):

Solar panels harness the energy of the sun to create electricity. However, there are some downsides to solar, one of these being the cost, and another being the fact that solar panels are only able to harness around twenty percent of the energy that they are exposed to.

I experimented with coating solar panels with a mixture made of beet juice and titanium dioxide (TiO₂) to see whether their efficiency could be improved as measured in DC volts. My hypothesis was that the beet juice would help capture more solar energy than the solar panel alone and then pass it to the titanium dioxide. The TiO₂ would facilitate the movement of electrical charges, which is highly important for generating electricity.

I tested five solar panels with no coating as a control group, five painted with titanium dioxide and white vinegar, and five painted with a mixture of TiO₂ and beet juice. In a room with no outside light coming in, I exposed each group to a light and measured and recorded the voltage readings on each individual panel after five minutes.

I took the mean average of the voltage readings from each of the three groups. I then calculated the results based on the average full scale solar panel. I found that in volts, you would have 240.1676, 233.8105, and 242.8787 for the three test groups respectively on full sized solar panels. Although the beet juice plus titanium dioxide coated panels performed slightly better than the control, it was not a significant enough difference to draw firm conclusions, but I believe warrants further testing especially when scaled up. Although these results do not show much of a difference, perovskites, which I researched and touch on in my presentation, could be a significant innovation that might work even better.

To gather further data, I would propose redesigning my experiment with changes to three parameters. First, I would use a higher wattage test light to better mimic the sun. Secondly, I would take more sample tests in each group to see if variations were significant. Lastly, I would increase the amount of time each panel spends under the light and record the voltage over time instead of at one point.

I hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I also attest that the above properly reflects my own work.

Finalist's Signature:

Date:

In addition, all students must complete the ISEF Student Checklist (1A), Research Plan, Approval Form (1B), and Checklist for Adult Sponsor (1), and any other ISEF forms required for this type of project. See the International Rules and Guidelines for form requirements. Return COPIES of all of these forms to your Regional Fair Director with you Finalist Verification/Permission Form. **A signed copy of this form must be included in your notebook.**