

Solar Cooking with Phase Change Thermal Storage Medium: More Power!

Half the global population cook with fuels such as charcoal and coal on open fires or locally-made stoves emitting high levels of carbon monoxide which kills about four million people a year (mostly children) from associated emissions (Reuters, 2019). It is not uncommon that biomass cooking has led to deforestation and causes pollution to the environment. This presentation will focus on the Insulated Solar Electric Cooking (ISEC) as a solution to the global poor cooking problem. ISEC is an inexpensive (~\$1.00) heater that connects directly to a solar panel to allow for cooking food and providing electricity. ISEC uses Direct DC Solar (DDS) to power a resistive heater over a variety of solar intensities and also acts as a rough, very inexpensive voltage regulator to charge batteries and power appliances. With a 100 W solar panel, ISEC slowly cooks food. However, adding a thermal storage (erythritol) system allows for quicker cook times and the ability to cook food at non-peak solar hours with efficiency comparable to that of more expensive systems using battery storage and induction cooktops. Additionally, we explore ways to increase thermal conductivity and suppress supercooling. The ISEC could boil 1 liter of water under 30 minutes with a high device efficiency and continue to store energy for over 4 hours.

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