

Heat Transfer Optimization of a Solar Radiation Concrete Oven for Rural Areas

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Abstract

Creating healthy food and drinking water typically requires electricity and fuel sources that are not available in rural areas of underdeveloped countries. Many rural areas have an abundance of solar radiation which can be harnessed to create viable heating sources. This work investigates the design of a robust solar radiation concrete oven for cooking food and treating water for viruses. Selection and usage of materials for the oven is optimized through heat transfer parametric studies performed with the the COMSOL Multiphysics® software. The oven is composed of several interacting material layers including: a) walls composed of concrete, brick, and insulators, b) a steel chamber for water retention, c) a soapstone cooking chamber, d) an oven cap made of glass embedded in concrete, and e) solar reflective panels. Temperature distribution throughout the oven will be examined and discussed, and experimental verification studies for the model will be explored.