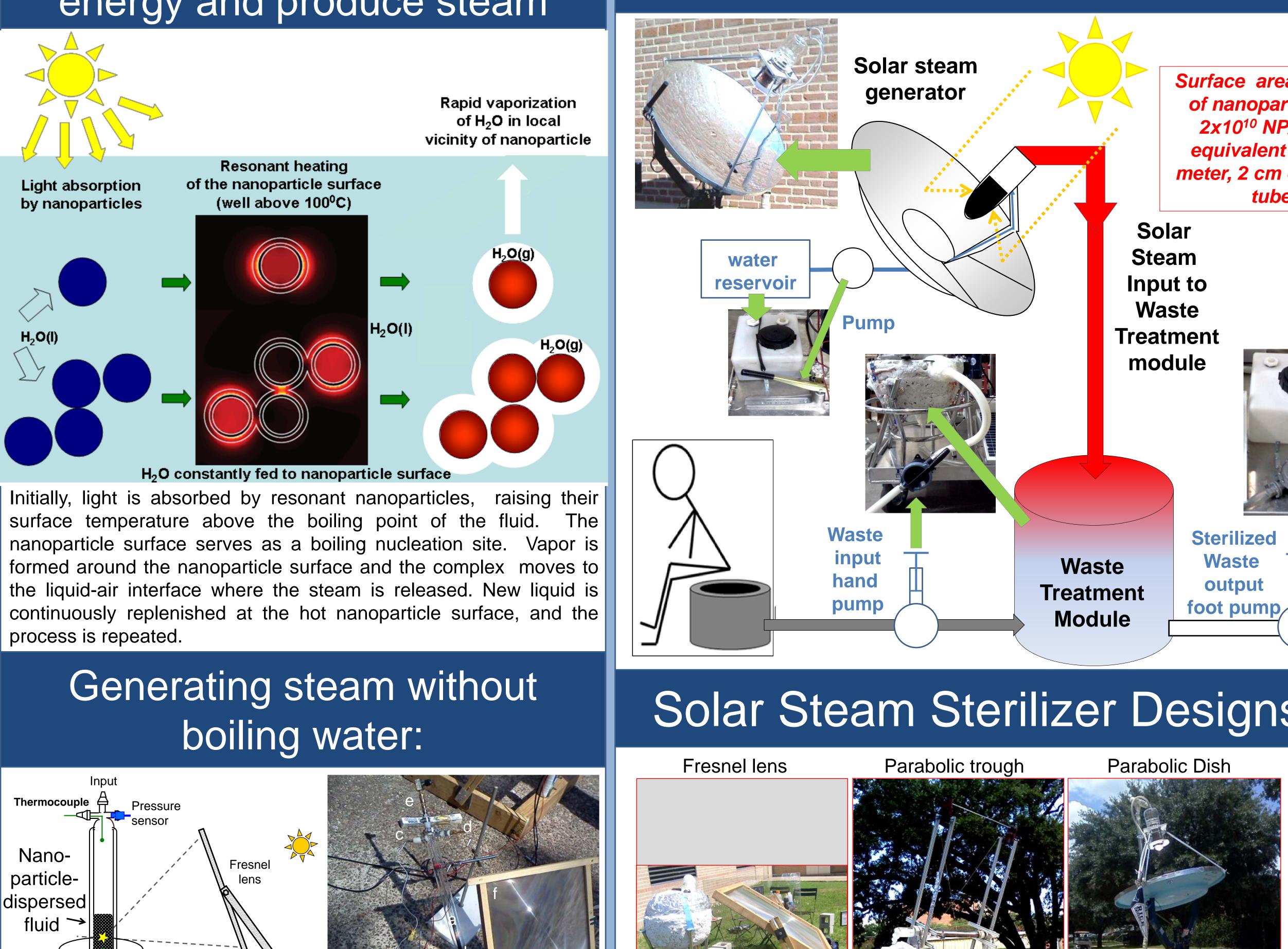
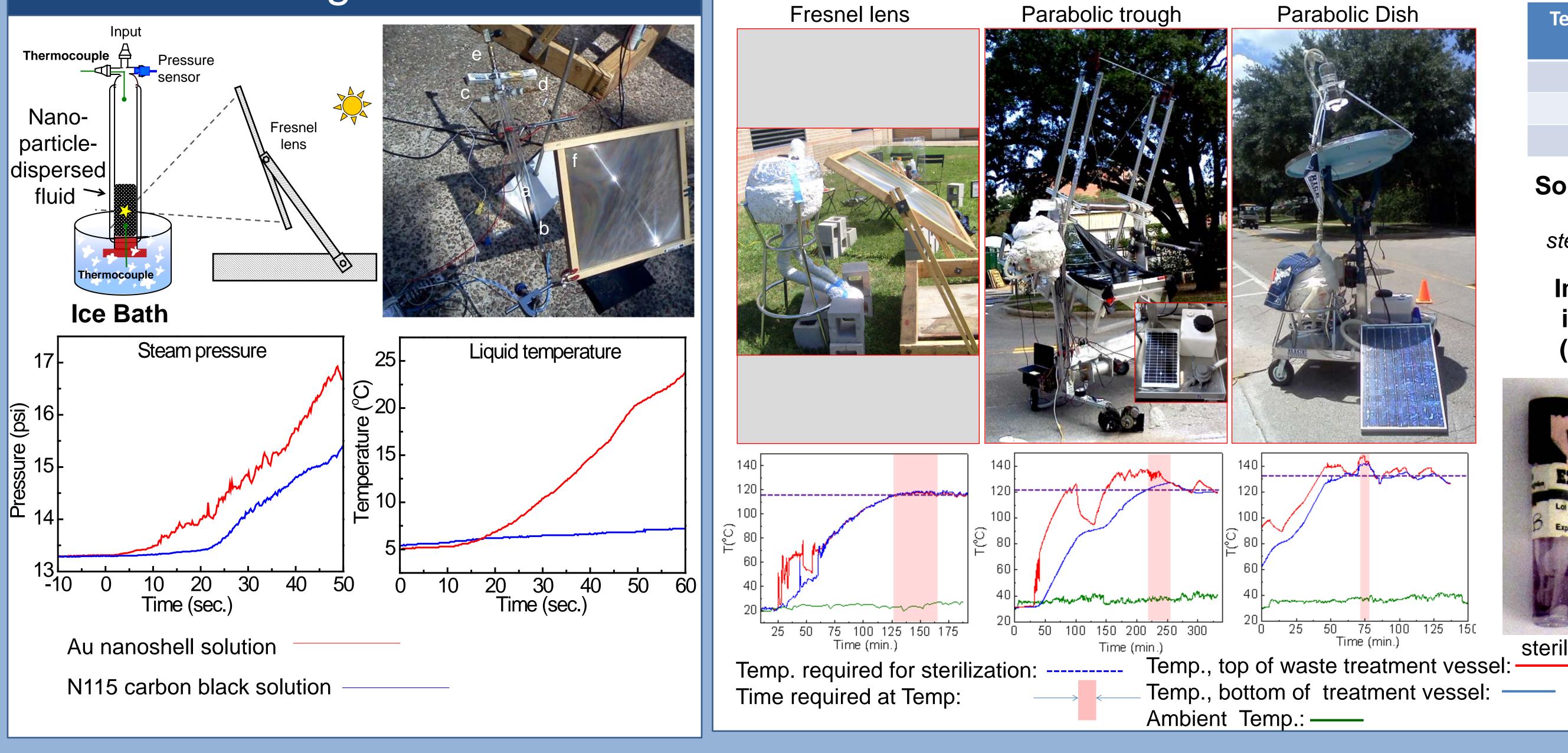
RICE A solar steam sterilizer for the treatment of human waste Oara Neumann,¹ Curtis Feronti,² Anjie Dong,³ Albert Neumann², Isadora Calderon,³ and Naomi Halas¹

¹Department of Electrical and Computer Engineering, ²Department of Civil Engineering,³ Department of Mechanical Engineering, Rice University, Houston, TX 77005

Nanoparticles can harvest solar energy and produce steam

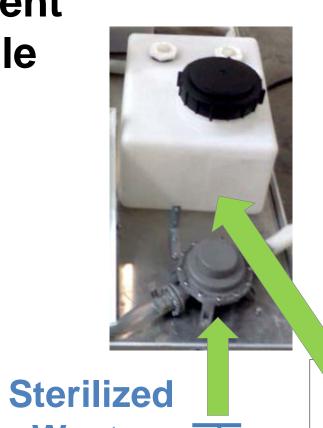


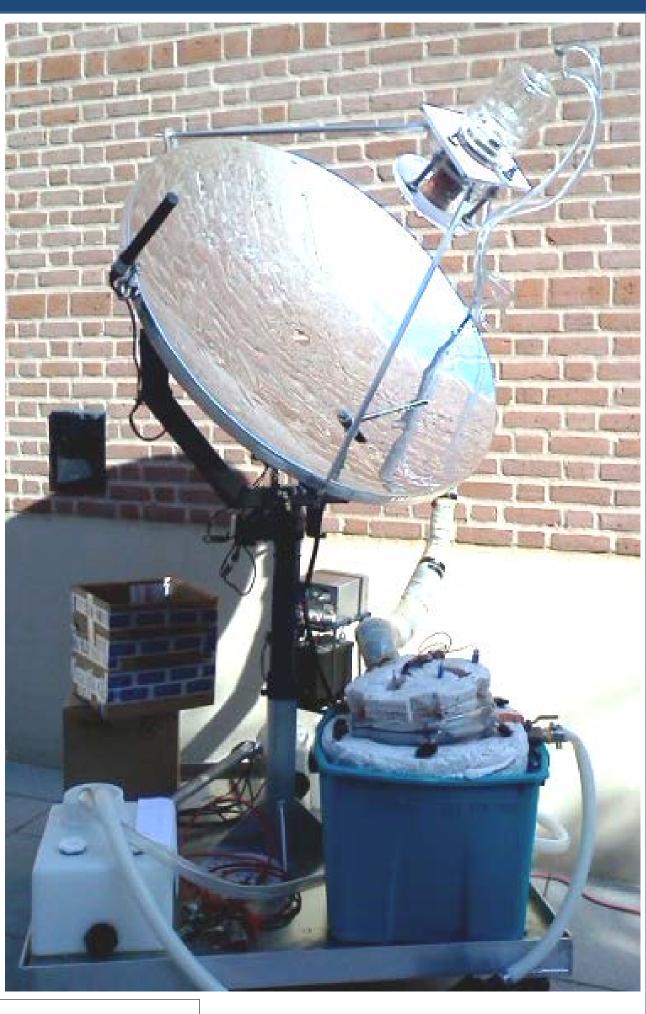


Solar Steam-Powered Toilet Design

Solar Steam Sterilizer Designs and Performance

Surface area of 1.2 L of nanoparticles at 2x10¹⁰ NP/ml is equivalent to a 20 meter, 2 cm diameter tube





Sterilized Waste

	Temperature (°C)	Incubation time (min.)
	132	4.6
	121	15.5
	115	30
Solar steam sterilization ver		ilization verified

by destruction of Geobacillus stearothermophilus (Mesa Labs, Inc.)

Immersed in Steam (ProTest)

sterile

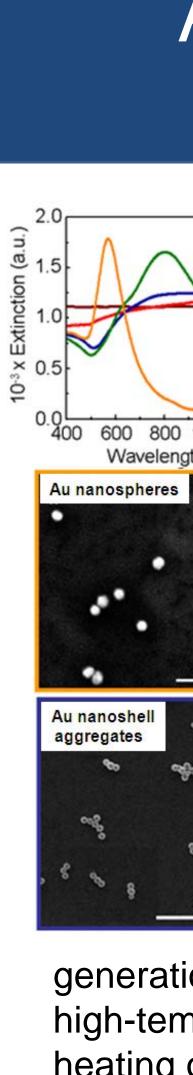
control

106 12/04/14



Immersed in





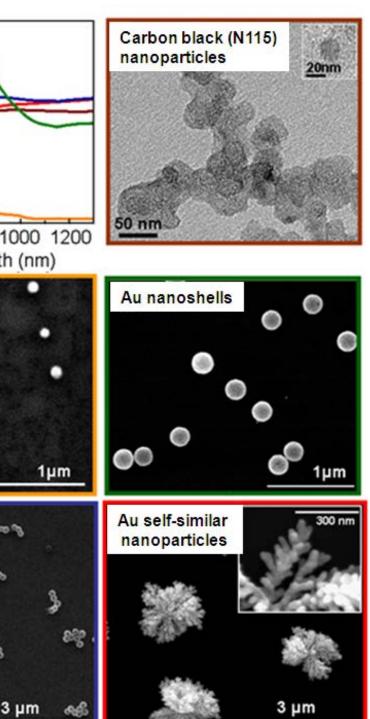
- Food Preparation
- Absorption refrigeration, air conditioning
- Solar processing of bioethanol,

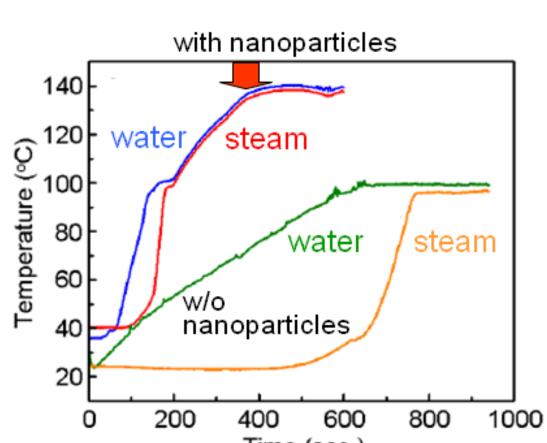
- Sanitizing medical waste, dental instruments
- Electricity generation (turbine)





A rapid source of hightemperature steam





Time (sec.) Left: a variety of nanoparticles can be used for solar steam generation. They must be strongly absorptive across the spectrum. The AM1.5 solar nanoparticles steam consumed the

generation process. Right: solar steam generation produces high-temperature steam rapidly, since it does not require heating of a large fluid volume.

Potential Solar Steam **Applications:**

Water purification/desalination (distillation)

chemical separations

Funding

BILLOMELINDA GATES foundation

