Molten Silicon Storage of Concentrated Solar Power with Integrated Thermophotovoltaic Energy Conversion

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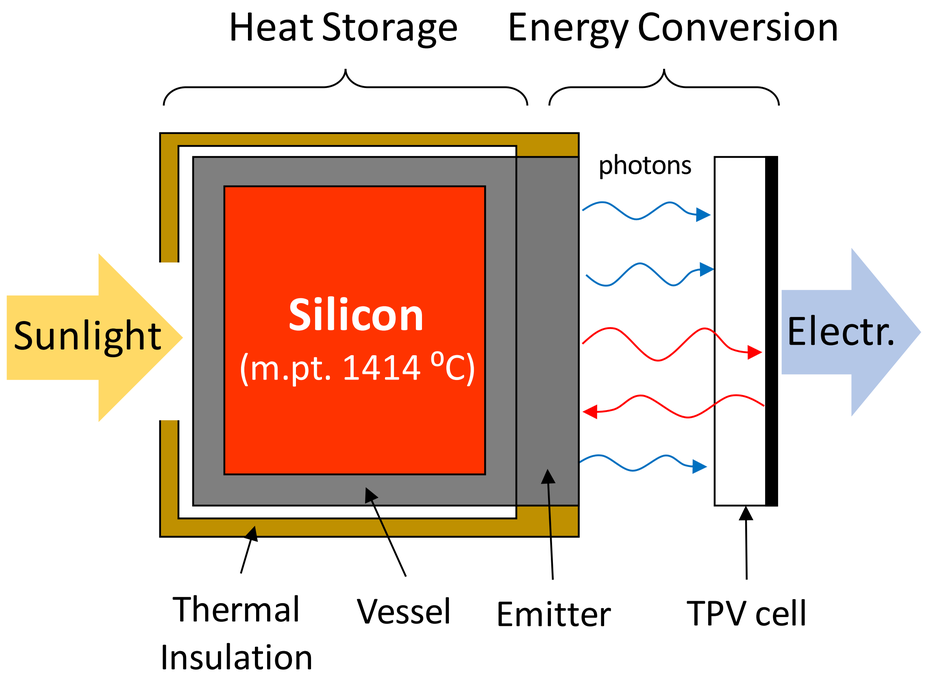
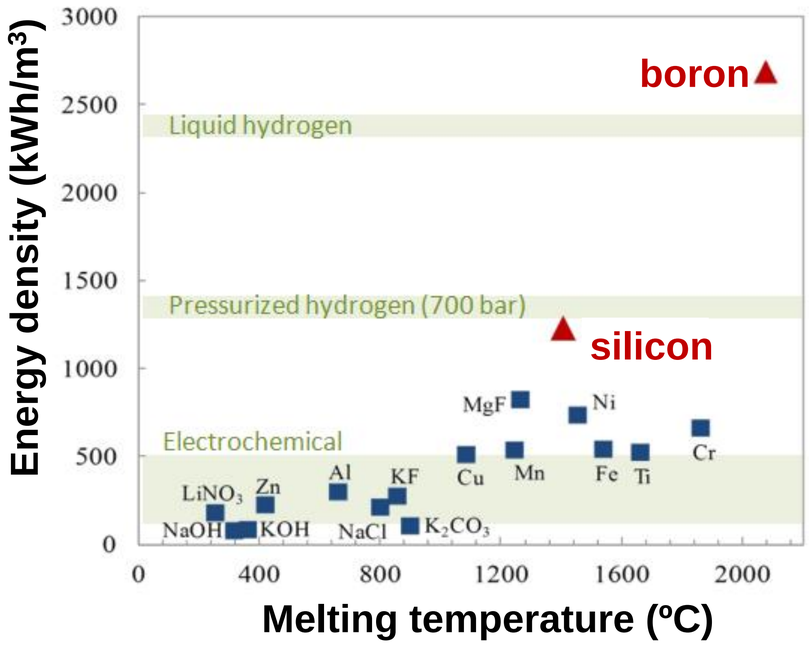
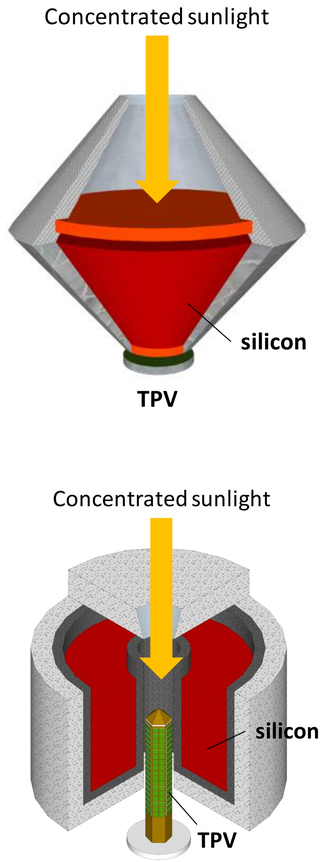
The Concept

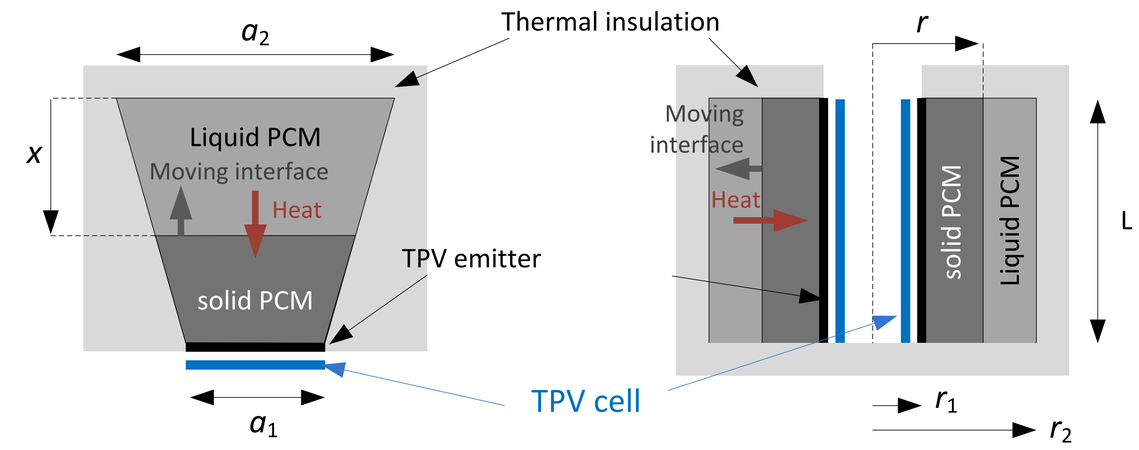






- ✓ LHTES in molten silicon at **1414ºC**
- ✓ **Thermophotovoltaic** (TPV) heat-to-power conversion
- ✓ More than **1000 kWh_{th}/m^3** (10 x molten salts)
- ✓ Several **10's kW_e/m^2** of TPV module area

Objective: Geometrical Optimization



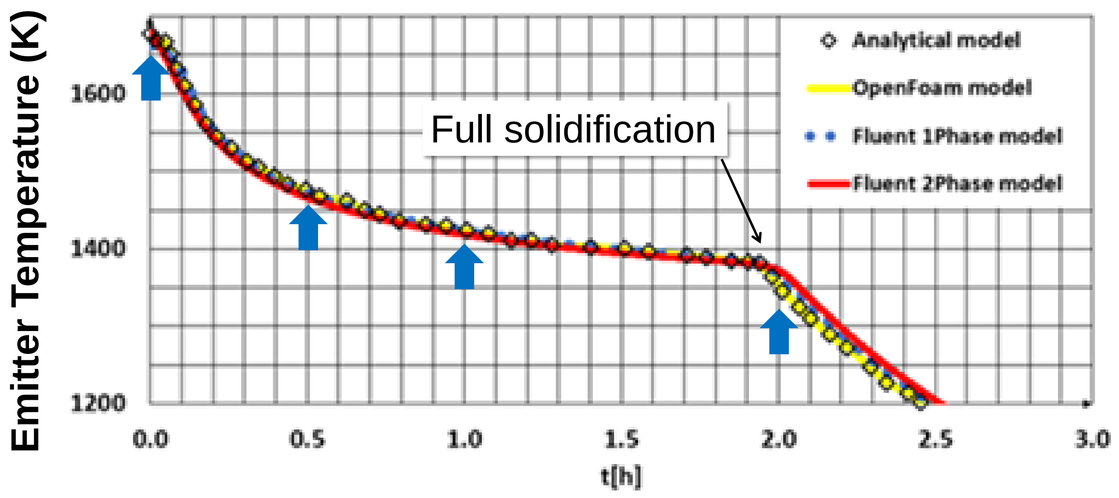
ITP (Inverted Truncated Pyramid) **HC (Hollow Cylinder)**

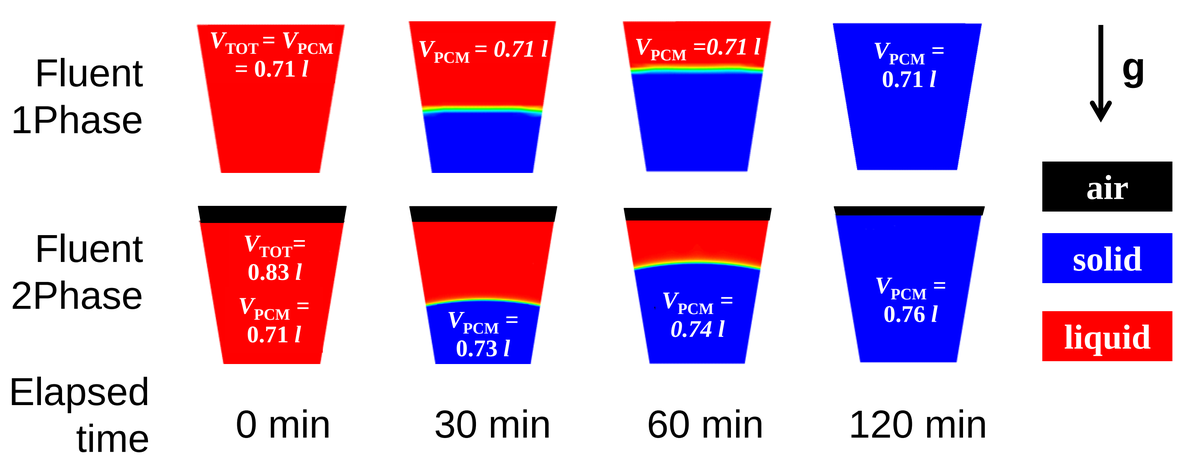
- ✓ Explore ITP and HC geometries using a quasi 1D-semi analytical model
- ✓ Parameters: **Tapering Ratio (A_1/A_2)** and **Length (L)**

Case	ITP	HC
Case 1 ($L = 10$ cm)	$A_1/A_2 = 0.50$	$A_1^* = A_1, V^* = V$
Case 2 ($L = 10$ cm)	$A_1/A_2 = 0.25$	$A_1^* = A_1, V^* = V$
Case 3 ($L = 20$ cm)	$A_1/A_2 = 0.50$	$A_1^* = A_1, V^* = V$
Case 4 ($L = 20$ cm)	$A_1/A_2 = 0.25$	$A_1^* = A_1, V^* = V$

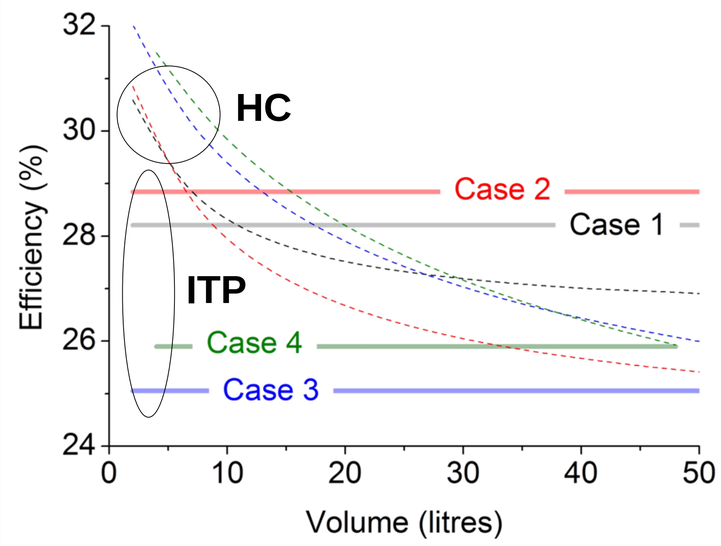
$$A_1 = a_1^2 \quad A_2 = a_2^2 \quad A_1^* = 2\pi r_1 L \quad A_2^* = 2\pi r_2 L$$

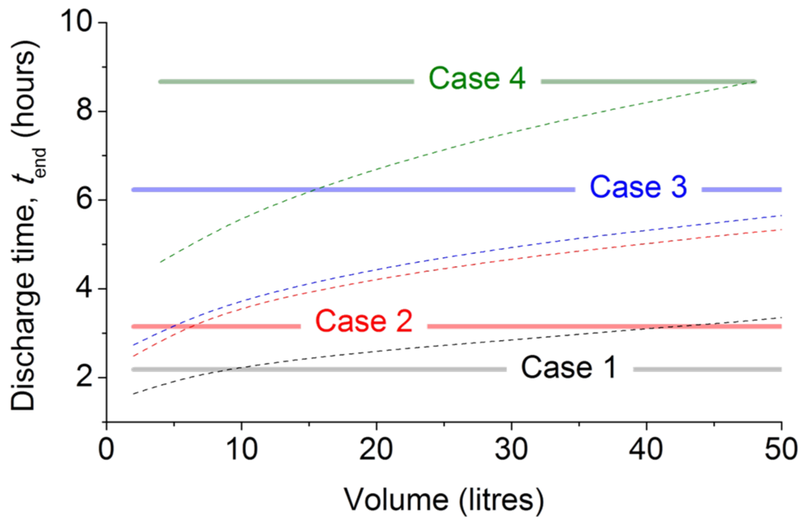
Models: Semi-Analytical Vs. CFD



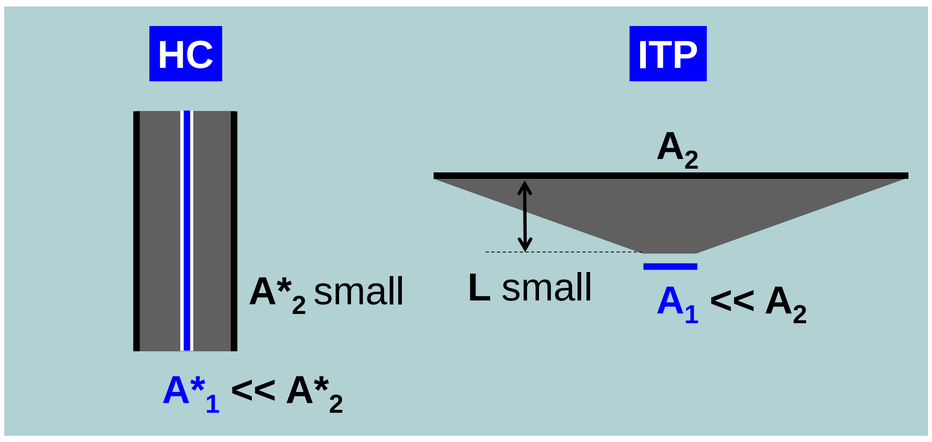


Semi-Analytical Model Results





Optimum geometries



Project Web Video
https://goo.gl/YJm2qX

Project Web Site
www.amadeus-project.eu

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