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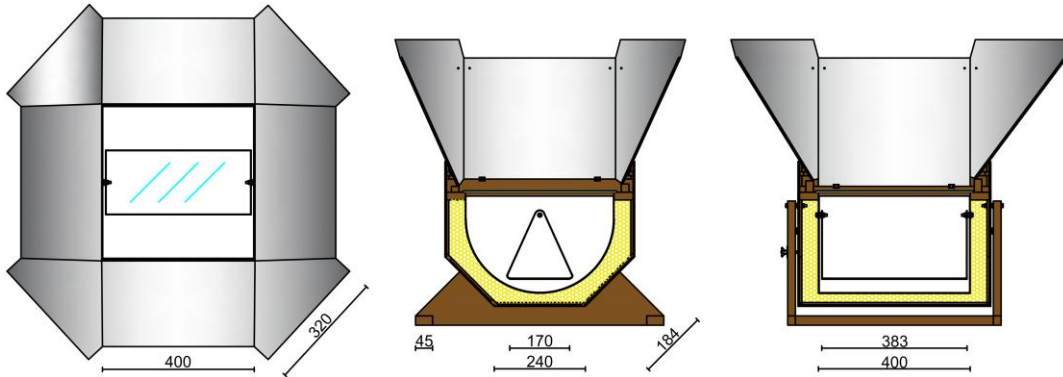
**Experimental testing of a solar box cooker with
thermal energy storage based on xylitol**

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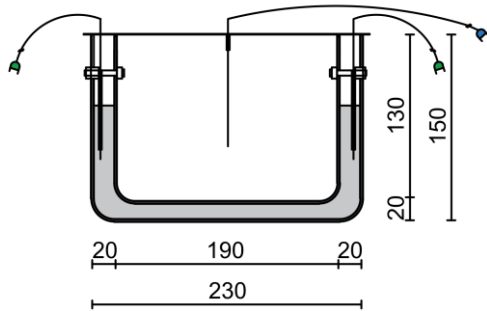
Our Prototype

Mass (kg)	20,1
Aperture area A_a (m ²)	0,681
Glass cover area A_g (m ²)	0,167
Concentration ratio C	4,07
Reflectance of aluminium mirrors	0,94
Transmittance of glass cover	0,90
Absorbance of paint	0,90



Thermal Energy Storage (TES)

	Outer pot	Inner pot
Diameter (cm)	23	19
Height (cm)	15	13
Capacity (l)	5,2	3,2
Mass (kg)	1,02	0,53

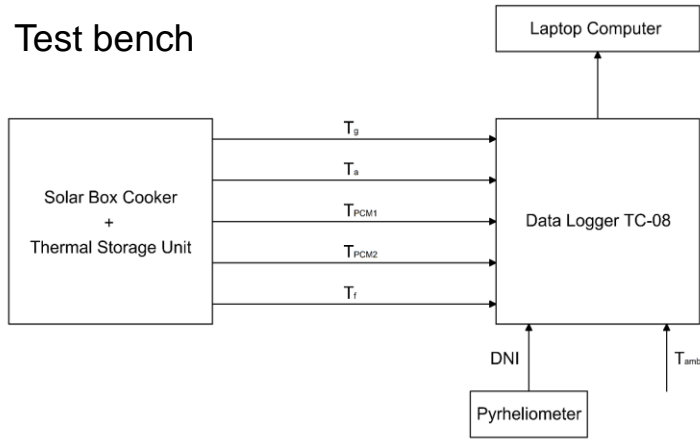


	Xylitol
Tmelting (°C)	92 - 94
Specific heat, solid phase Cps (J/g K)	1,33
Specific heat, liquid phase Cpl (J/g K)	2,36
Density, solid phase ρ_s (g/cm ³)	1,500 (20 °C)



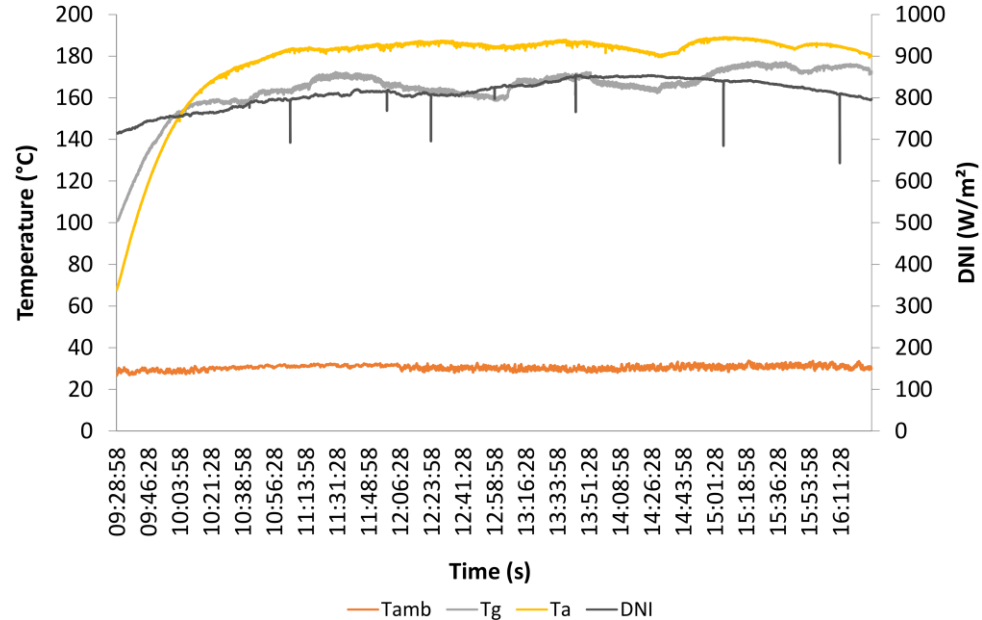
Tests without load

Test bench

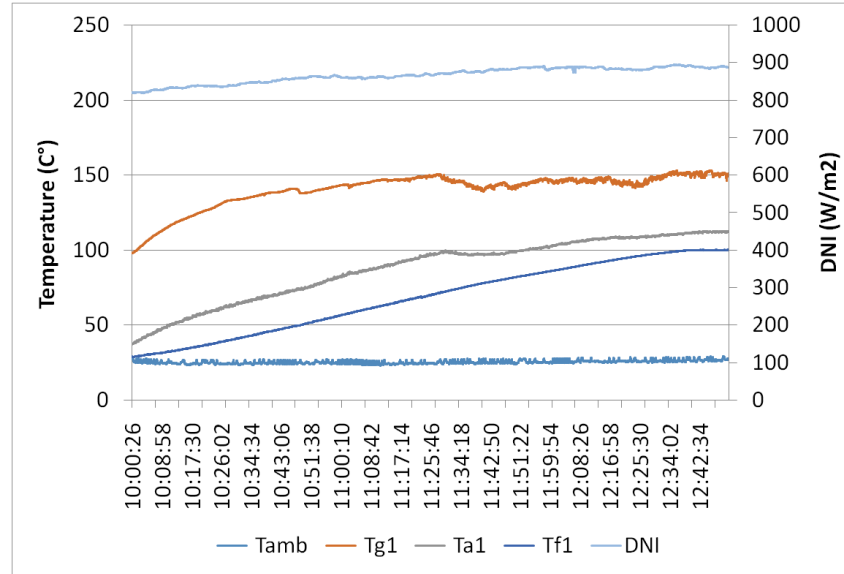


	Tamb	Ta, max	DNI	F1	F1,av
	°C	°C	W/m ²	°C/(W/m ²)	°C/(W/m ²)
23/05/2017	29,39	197,30	839,71	0,20	0,21
09/06/2017	23,39	187,42	971,75	0,17	0,17
13/06/2017	31,27	189,10	841,24	0,19	0,2

average value 0,19 0,19

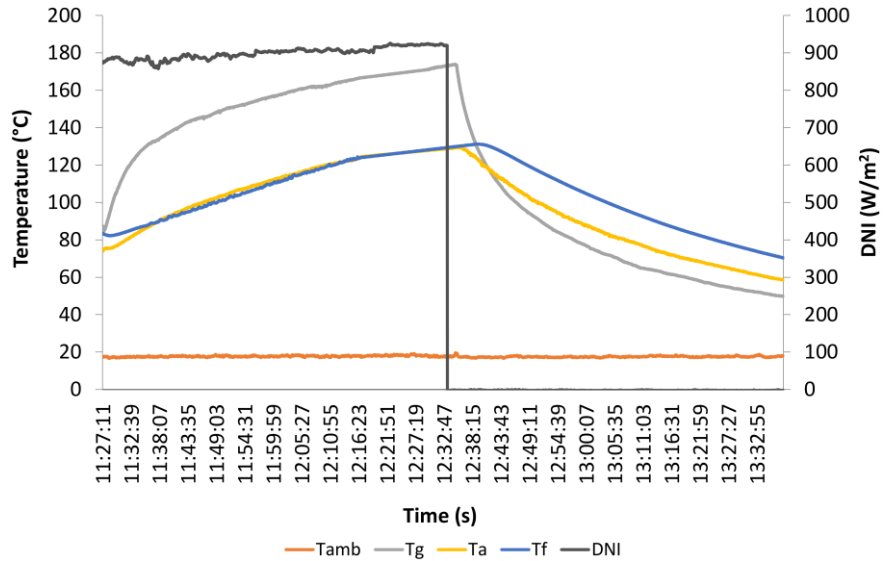


Tests with load (water)

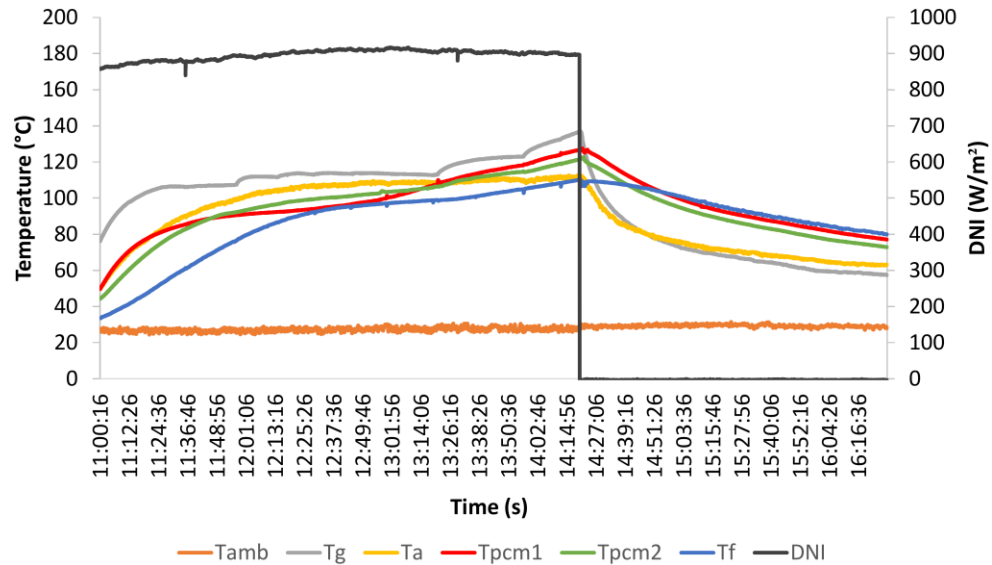


Quantity/Test	4	5	6	7	8
Date	02/08/2017	14/09/2017	01/06/2018	20/06/2018	04/07/2018
mf (kg)	2,00	2,00	3,00	3,00	3,00
DNI,av (W/m²)	736,84	867,18	869,28	825,54	597,10
Tamb,av (°C)	36,59	25,00	27,23	28,29	27,88
Δth (h)	1,45	1,68	1,20	1,44	1,77
ts (h m²/kg)	0,49	0,57	0,27	0,33	0,40
tch (h m²/kg)	0,40	0,55	0,26	0,30	0,27
η_{av}	0,16	0,12	0,25	0,22	0,24
F2	0,09	0,07	0,14	0,12	0,16

Tests with load (silicone oil and silicone oil + xylitol)



Test with silicone oil



Test with silicone oil and xylitol

Comparison of the results

- Heating phase

Quantity/Test	Tests with silicone oil			
	9	10	11	12
Date	27/09/2018	11/06/2019	12/06/2019	17/06/2019
mf (kg)	1,5	1,5	1,5	1,5
m _{PCM} (kg)	-	-	-	-
T ₁ (°C)	55	55	55	55
T ₂ (°C)	110	110	110	110
DNI _{av}	876,49	718,69	588,64	749,41
Tamb,av (°C)	14,22	30,91	28,17	28,57
Δth (h)	1,24	0,83	0,73	0,71
ts (h m ² /kg)	0,56	0,38	0,33	0,32
tch (h m ² /kg)	0,55	0,30	0,22	0,27
η _{av}	0,05	0,09	0,13	0,10
F2	0,04	0,07	0,12	0,07

Tests with silicone oil and xylitol		
13	14	15
03/06/2019	04/06/2019	05/06/2019
2,0	2,0	2,0
2,5	2,5	2,5
55	55	55
110	110	110
900,72	793,43	794,45
27,29	28,64	28,23
2,85	1,95	1,68
0,97	0,67	0,76
0,97	0,59	0,67
0,03	0,05	0,04
0,02	0,03	0,03

- Cooling phase

Quantity/Test	Tests with silicone oil			
	9	10	11	12
Date	27/09/2018	11/06/2019	12/06/2019	17/06/2019
T ₂ (°C)	110	110	110	110
T ₃ (°C)	80	80	80	80
Tamb,av (°C)	17,51	30,36	29,87	28,64
Δtc (h)	0,48	0,78	0,78	0,69

Tests with silicone oil and xylitol		
13	14	15
03/06/2019	04/06/2019	05/06/2019
110	110	110
80	80	80
29,27	31,03	28,08
2,11	2,27	1,64