SWC LEIGTHWEIGHTSTRUCTURES FOR SOLARINTEGRATION

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1. Sustainability is the newly ascendant global policy issue of the 21st century

Saving the Climate - Saves You Money - How Buildings Can - Use Energy Intelligently:
integrative use of different renewable energy sources to get off fossil fuels.
The basement of this development is the sun (solar energy and the cool sky) and our technical know how and the compliance with the sustainability regulations. IsoSol is a smart low cost system with advantages for free – energy in abundance:

- electricity from the sun
- heat from suncooling and chilling the solar modules to boost the earnings of solar energy
- high efficient insulating
- sustainable materials and technologies
- renewable raw material FSC certified
- technologies for system controlled operations
- optimised systems integrating of the operations
- perfect building integration

We get a functional building skin with less physical drawbacks by using the integrative design and the modular construction system Isosol - lightweight - fitting - cut by laser – sustainable smart and cheap
Oil heaters produce per 1000 W – 375 g/ CO^2
Heat pumps 1000 W – 183 g/CO^2
Solar thermal 1000W - 44 g/CO^2 we develop the platform for BIPVT -
Building Integrated Photo Voltaic and Thermal devices
Our world is a great market for sustainability – renewable energy – passive ore active houses – a big deal for the world wide job market and the economics. The investments raised in Germany from 10 Billion Euros to more than 20 Billion Euros from 2007 to 2009 – there are 339 000 Employees in 2009 in this emerging market.

2. Natural Resources - Physical Facts

The global irradiance with 1000 W effects an input of about 150 W electricity, 300 - 650 W solar thermal energy, and cooling by night with infrared radiation into the orbit with 50 – 80 W are available per square meter on earth.

This evokes the integration of a the combination -
- Solar Photovoltaic + cooling the modules
- Solar Thermal
- Night cooling
- Integrated Ventilation
- Integrated Structure
- Integrated Insulation

3. System

The natural raw material are wood panels – they are strong – light – durable – insulating – cheap – common in the building business since a century – this sustainable high tech material – is cut by a new lasertechnology – into a model kit to build the modular boxgriders bearing structural and all technological tasks a energy efficient building envelope needs.

4. Results

The system technology is a platform for:

the integration of Solar panels, they are cooled by air ventilation this air is used in heat exchangers for the heat pump or water storage

the structure of the hollow box griders is at the same time the ventilation piping

the structure offers plenty of space for cheap insulation material no vapor barrier is required

the structure offers additional space for the inside and outside technical installation there is place for PCM materials or heating and cooling – and other technical systems

roofs and walls need only one interior layer – outside the solar panel or glacing is watertight – inside is a plaster board or individual interior cladding

the system technology is based on a modular curtain walling – so the integration of glass or windows is easily to install

the modular box griders can be prefabricated or build like a lego kit on the side with simple craftsmanship

5. References – Demonstration objects

1. 700 m² Solar roof with 95 kW – voltaic - 200 mm insulation - 50 kW heatpump – 74653 Künzelsau
2. 80 m² solar roof with 10 kW – voltaic – 300 mm insulation – 25 kW heatpump – in process – 74653 Künzelsau
3. Beam and wall structure of solar decathlon – HTWG – Konstanz 2012 – in process
4. Solar plus energy rertrofitting terraced housing – R+D project - in process 74653 Künzelsau

6. Research

Actually: absorber pretests with the ITW – Stuttgart to achieve the accreditation for basic integrated solar absorbers into the IsoSol system.

7. Request for investors – R+D Partners – Demonstration Projects

We search partners for future projects – investors – R+D project partners -

Appendix: UNITS AND SYMBOLS IN SOLAR ENERGY

Table 1: Recommended symbols for materials properties

Quantity	Symbol	Unit
Specific heat	c	J kg^{-1} K^{-1}
Thermal conductivity	k	W m^{-1} K^{-1}
Extinction coefficient[+]	K	m^{-1}
Index of refraction	n	
Absorptance	α	
Thermal diffusivity	α	m^2 s^{-1}
Specific heat ratio	γ	
Emittance	ε	
Reflectance	ρ	
Density	ρ	kg m^{-3}
Transmittance	τ	

[+] In meteorology, the *extinction coefficient* is the product of K and the path length and is thus dimensionless.

Table 2: Recommended symbols and sign convention for sun and related angles

Quantity	Symbol	Range and sign convention
Altitude	α	0 to ± 90°
Surface tilt	β	0 to ± 90°; toward the equator is +ive
Azimuth (of surface)	γ	0 to 360°; clockwise from North is +ive
Declination	δ	0 to ± 23.45°
Incidence (on surface)	Θ, i	0 to + 90°
Zenith angle	Θ_z	0 to + 90°
Latitude	Φ	0 to ± 90°; North is +ive
Hour angle	ω	-180° to +180°; solar noon is 0°, afternoon is +ive
Reflection (from surface)	r	0 to + 90°

Table 3: Recommended symbols for miscellaneous quantities

Quantity	Symbol	Unit
Area	A	m^2
Heat transfer coefficient	h	W m^{-2} K^{-1}
System mass	m	kg
Air mass (or air mass factor)	M	
Mass flow rate	$\dot{m}$	kg s^{-1}
Heat	Q	J
Heat flow rate	$\dot{Q}$	W
Heat flux	q	W m^{-2}
Temperature	T	K
Overall heat transfer coefficient	U	W m^{-2} K^{-1}
Efficiency	η	
Wavelength	λ	m
Frequency	ν	s^{-1}
Stefan-Boltzmann constant	σ	W m^{-2} K^{-4}
Time	t, τ, Θ	s

Table 4: Recommended subscripts

Quantity	Symbol
Ambient	a
Black-body	b
Beam (direct)	b
Diffuse (scattered)	d
Horizontal	h
Incident	i
Normal	n
Outside atmosphere	o
Reflected	r
Solar	s
Solar constant	sc
Sunrise (sunset)	sr, (ss)
Total of global	t
Thermal	t, th
Useful	u
Spectral	λ

Table 5: Recommended symbols for radiation quantities

	Preferred name	Symbol	Unit
a)	Nonsolar radiation		
	Radiant energy	Q	J
	Radiant flux	Φ	W
	Radiant flux density	Φ	W m^{-2}
	Irradiance	E, H	W m^{-2}
	Radiosity or Radiant exitance	M, J	W m^{-2}
	Radiant emissive power (radiant self-exitance)	Ms, E	W m^{-2}
	Radiant intensity (radiance)	L	W m^{-2} sr^{-1}
	Irradiation or radiant exposure	H	J m^{-2}
b)	Solar radiation		
	Global irradiance or solar flux density	G	W m^{-2}
	Beam irradiance	G_b	W m^{-2}
	Diffuse irradiance	G_d	W m^{-2}
	Global irradiation	H	J m^{-2}
	Beam irradiation	H_b	J m^{-2}
	Diffuse irradiation	H_d	J m^{-2}
c)	Atmospheric radiation		
	Irradiation	$\Phi\downarrow$	W m^{-2}
	Radiosity	$\Phi\uparrow$	W m^{-2}
	Exchange	Φ_N	W m^{-2}