Polymeric Materials for Solar Thermal Applications

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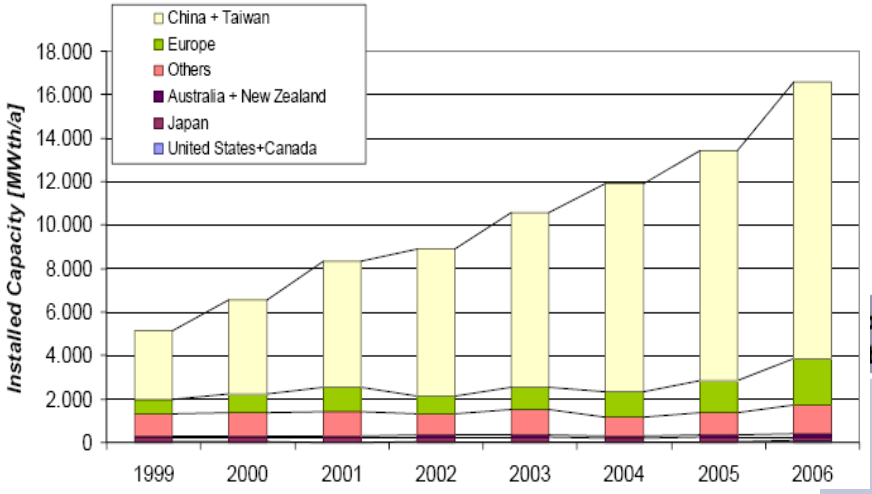
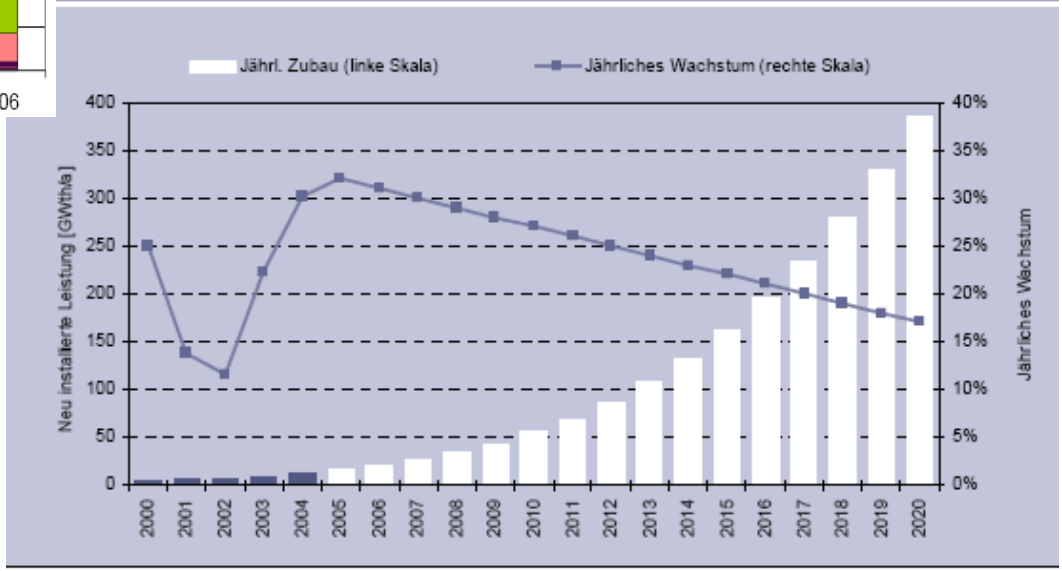
Background: Solarthermal growth



20% Annual growth:
390 GW ~ 560 Mm² in 2020

How to provide the raw materials?

. 24: Sarasin-Prognose des weltweiten Solarkollektoren-Marktes. Neu tallierte Kollektorkapazität in GW_{th} pro Jahr

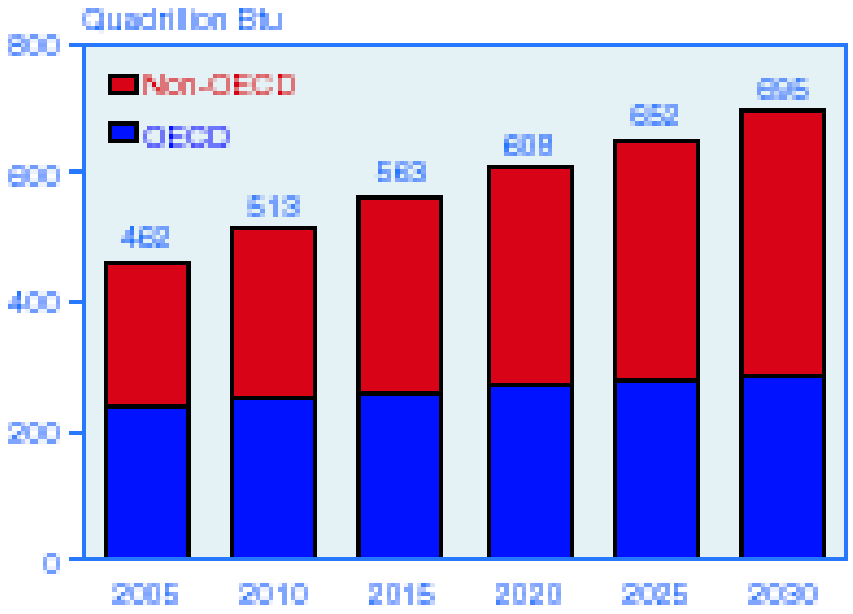


Quelle: Sarasin, 2005

TASK39

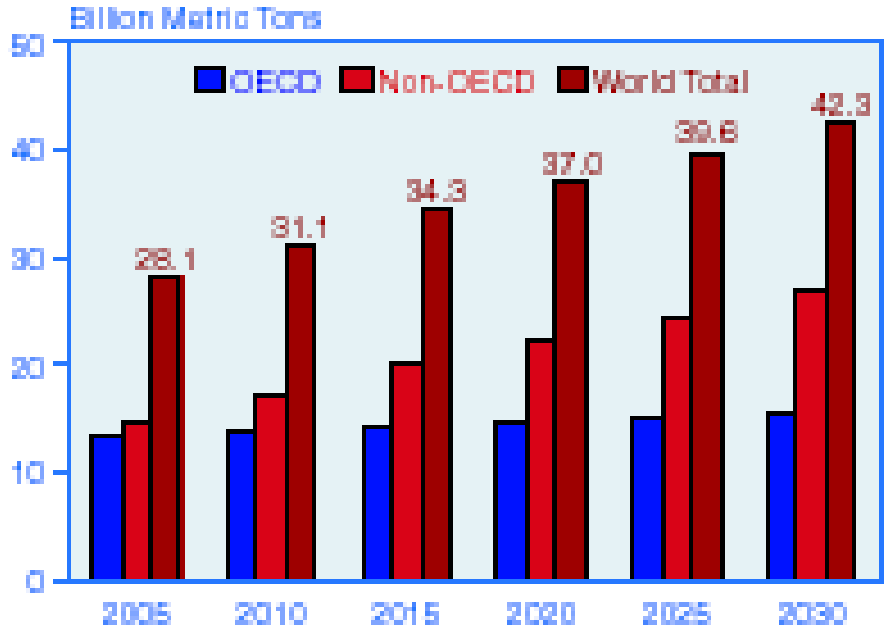
Energy consumption

Figure 1. World Marketed Energy Consumption, 2005-2030



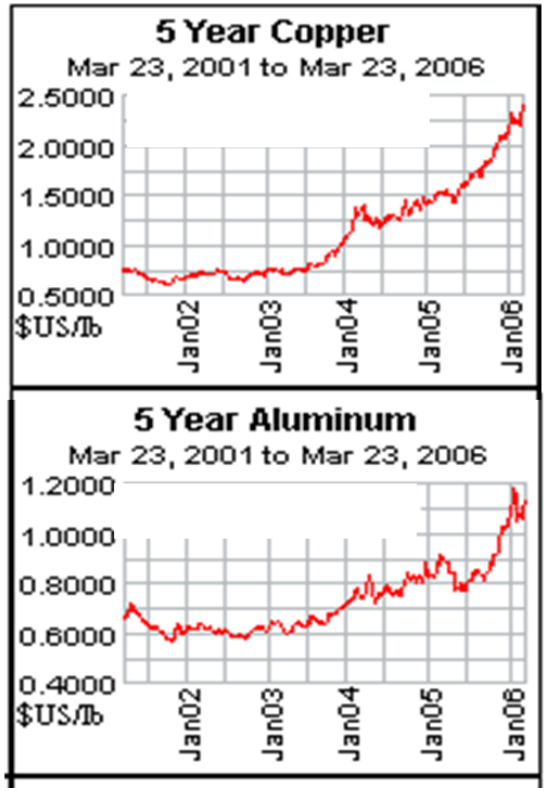
Sources: 2005: Energy Information Administration (EIA), *International Energy Annual 2005* (June-October 2007), web site www.eia.doe.gov/iea. Projections: EIA, World Energy Projections Plus (2008).

Figure 8. World Carbon Dioxide Emissions, 2005-2030



Source: Energy Information Administration, World Energy Projections Plus (2008).

Cost scenarios

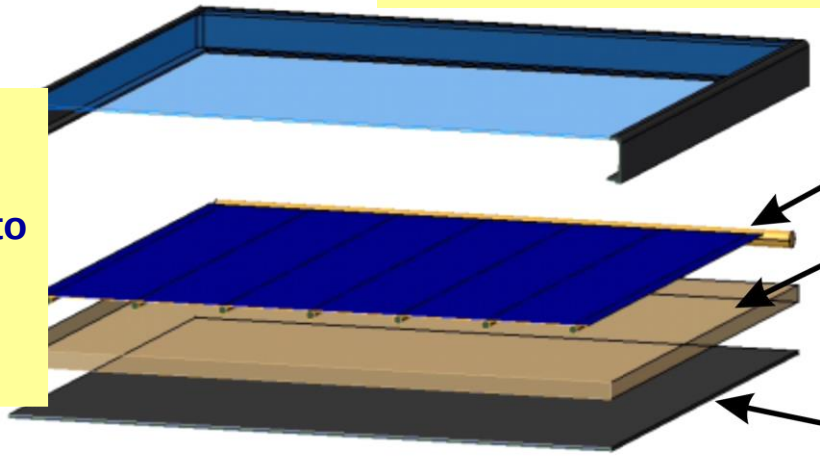


cost (eur/m2)		metal	plastics	savings	savings%
Materials					
	absorber	38	22	16	42%
	transp cover	23	14	9	39%
	casing	6	4	2	33%
	sealing	3	3	0	0%
	insulation	2	2	0	0%
	other	4	4	0	0%
Material total		76	49	27	36%
labor		15	9	6	40%
Total production		91	58	33	36%
overhead		50	50	0	0%
Panel cost		**141**	**108**	33	23%
Installation		100	70	30	30%
Grand Total		**241**	**178**	63	26%

Objectives

- Assessment of the **applicability** and the **cost reduction potential of polymeric materials** for solar thermal systems
- Novel polymer based **designs**
- Evaluation of **less expensive materials**
- Assessment of **durability** and **reliability**
- Promote increased **confidence** in the use of these products
- Development and application of appropriate t**esting and certification methods**
- Identification of **less expensive manufacturing** processes

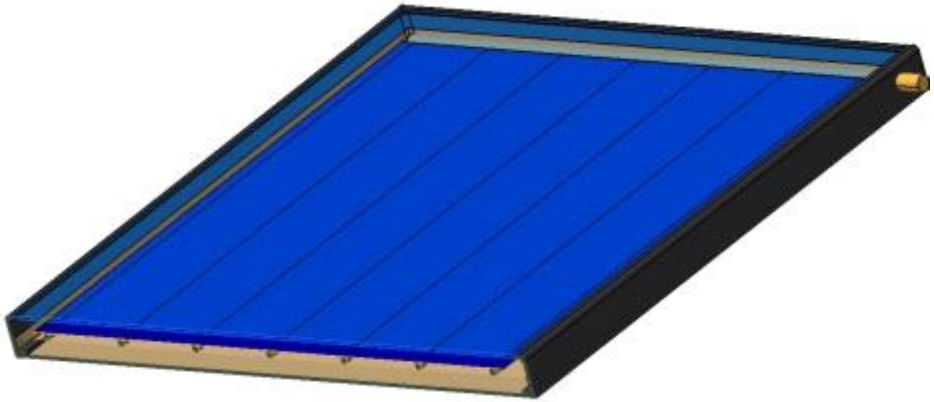
Collector components



Assembly Process

→ Absorber and thermal insulation inserted into collector trough

→ Back plate bonded to collector trough



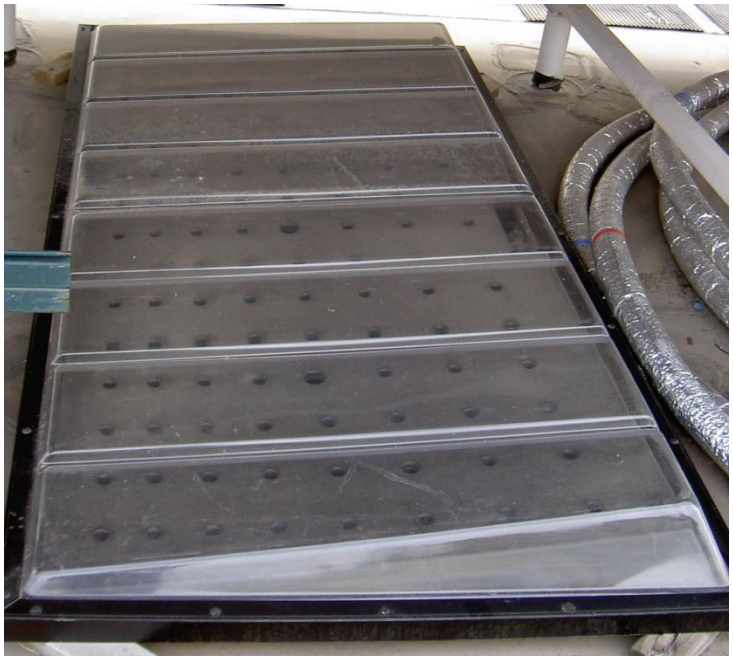
Material Selection (example)

→ glazing of collector trough: transparent PA

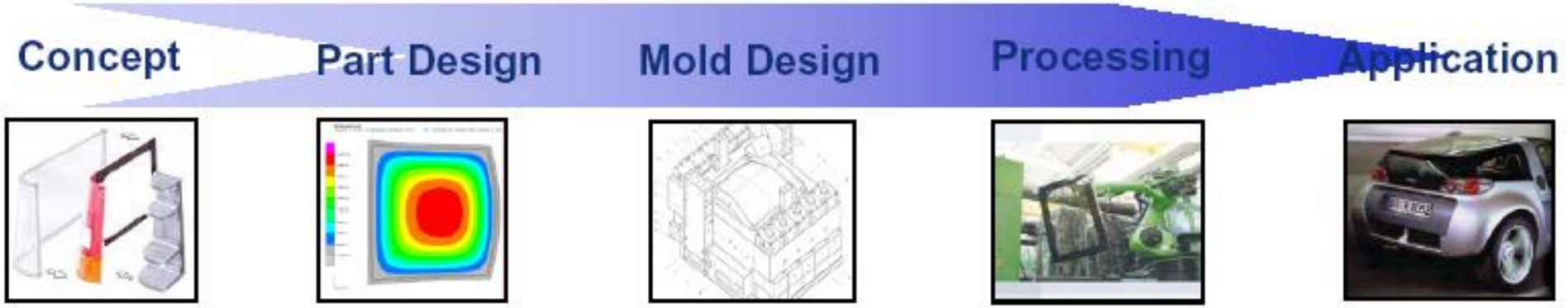
→ structure of collector trough: PA coloured

→ back plate: PA coloured

Integrated storage collectors



Mass production



Design-Concept

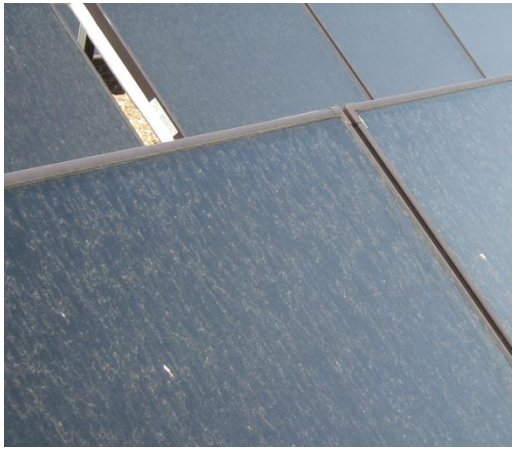
Creation of suitable materials

Processing Development

Coating application

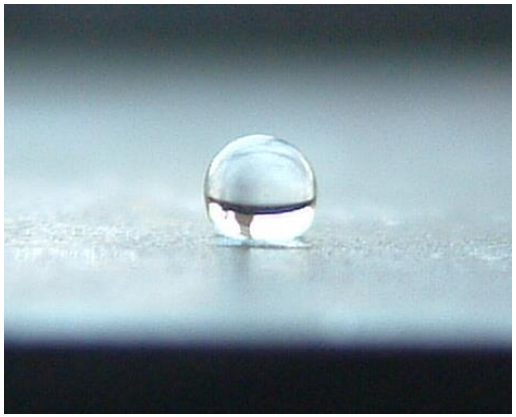
Functional coatings

thermotropic polymeric materials allowing for temperature control of a collector



thickness insensitive spectrally selective paints (TISS) and glazing with self-cleaning properties

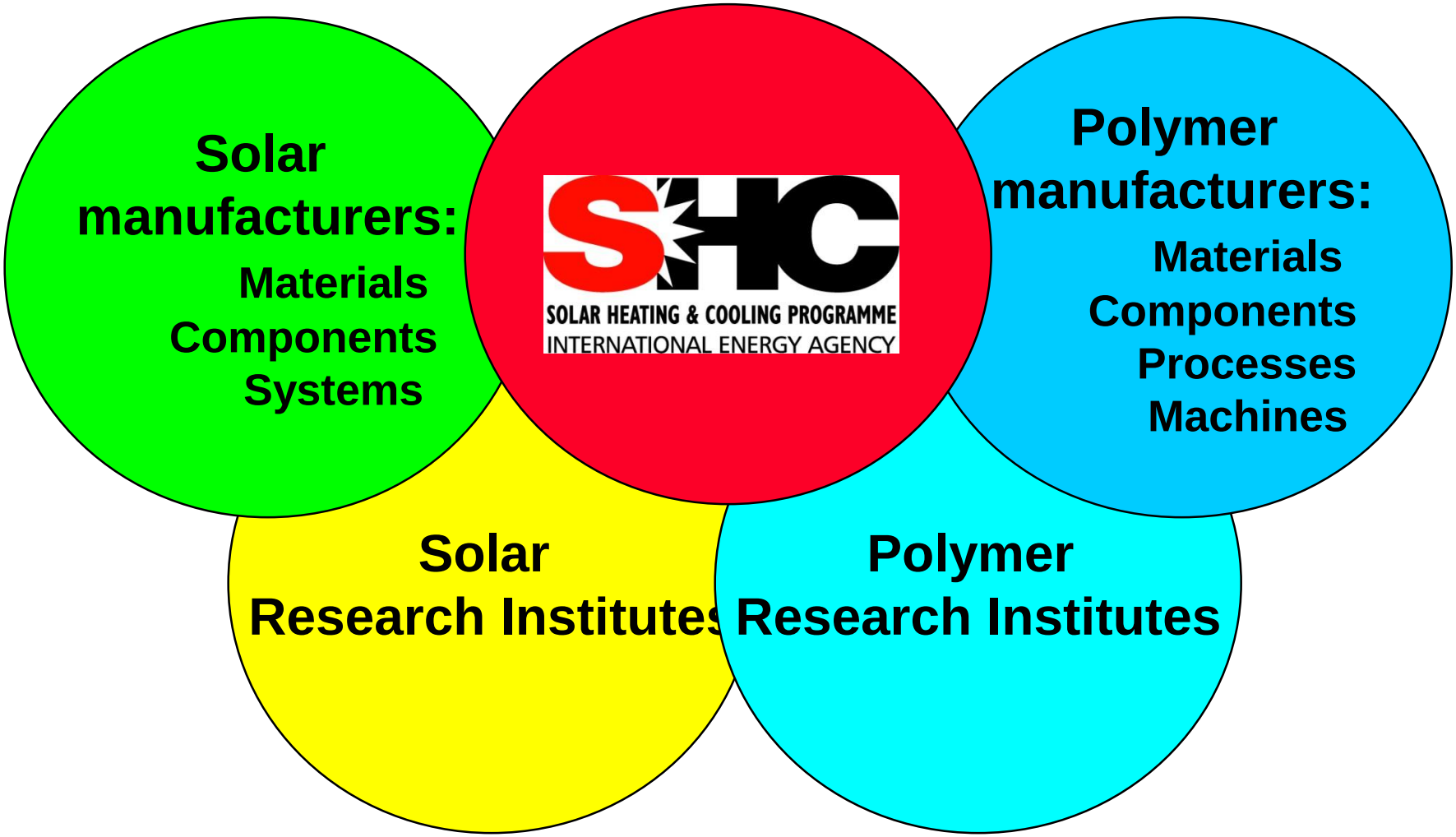
adhesion of functional polymeric materials to polymeric substrates



ageing behaviour of functional polymeric layers and glazing under service relevant loading and environmental conditions

Building integration

Stakeholder



Subtask division

SUBTASK A

- Information
- Dr. Michaela Meir
- Norway

SUBTASK B

- Collectors
- Dr. Stephan Fischer
- Germany

SUBTASK C

- Materials
- Prof. Dr. mont. Gernot Wallner
- Austria

OPERATING AGENT: Dr. Michael Köhl, FhG ISE, Germany

Subtask A:

State of the art: **Polymeric materials in solar thermal applications**

Taskforce on **total cost accounting approach (incl. LCA)**

Taskforce on **standards, regulations and guidelines**

Database of **successful architectural integration**

Dissemination of information

Subtask A:

Polymeric materials for solar thermal collectors – Market overview and life cycle study

Dr. Michaela Meir

NORWAY

Subtask B:

Design of polymer-friendly systems
- pressure-less
- drain-back
- thermosiphon

Development of polymeric collectors
- building integrated
- overheating-control

Design of polymeric absorbers

Subtask B:

Requirements for polymeric based collectors and components, and examples for developed products

Dr. Stephan Fischer

GERMANY

Subtask C:

Tailor-made polymeric materials for collectors and heat storages

Prof. Dr. mont. Gernot M. Wallner

AUSTRIA

Subtask C:

Development of Multi-Functional Polymeric Materials

Processing and Evaluation of Components and Functional Coatings

Methods for Testing and Characterization of Polymeric Materials

Subtask A:

Polymeric materials for solar thermal collectors – Market overview and life cycle study

Dr. Michaela Meir

NORWAY