




Kunststofftechnik




Fraunhofer ISE
Institute for Solar Energy Systems




fumattech
Funktions- Bauelemente und Halbleitertechnik




HIAT




SolyiCore
www.solyicore.com




SGL GROUP
THE CARBON COMPANY




FILTRONA



SMS
silicon nitride sensors



TEXSYS

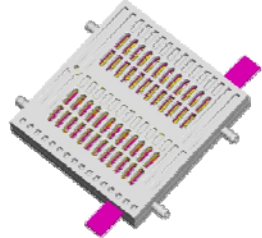


medset
MEDIZINTECHNIK

DDMFC – project report


From **components** to **stacks**
further on to **system** and the **application**

Lecture on 07.10.2008 at 12.00 a.m.
from Dr. Alexander Dyck on the **MiNaT** in Stuttgart



planar fuel cells as
energy supply for tomorrow

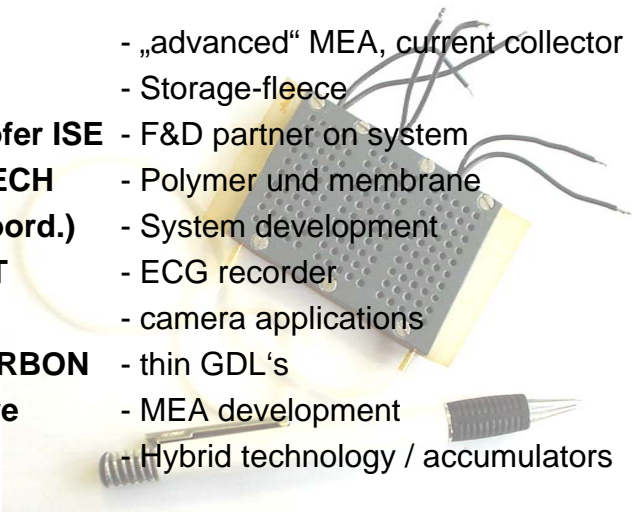
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1
07. October 2008 in Stuttgart




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consortium

(1) HIAT	- „advanced“ MEA, current collector
(2) Filtrona	- Storage-fleece
(3) Fraunhofer ISE	- F&D partner on system
(4) FUMATECH	- Polymer und membrane
(5) FWB (coord.)	- System development
(6) MEDSET	- ECG recorder
(7) sms	- camera applications
(8) SGL CARBON	- thin GDL's
(9) Solvicore	- MEA development
(10) TEXSYS	- Hybrid technology / accumulators



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2
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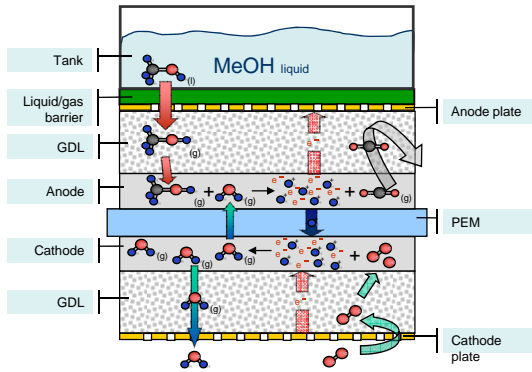


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DDMFC concept - Functional principle

Passively operated vapor-fed Direct Methanol Fuel Cells for portable applications


- Highly concentrated methanol
- Active or air-breathing cathode
- Water back diffusion from cathode to anode
- Anode plate with different opening ratios
- Additional vapor chamber



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3

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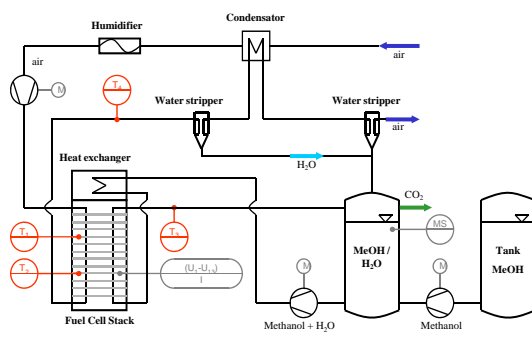
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Complexity of an active DMFC system

Active DMFC-Systems realizes

- Heating /Cooling
- Methanol supply
- Methanol dilution
- Air supply
- CO₂ removal

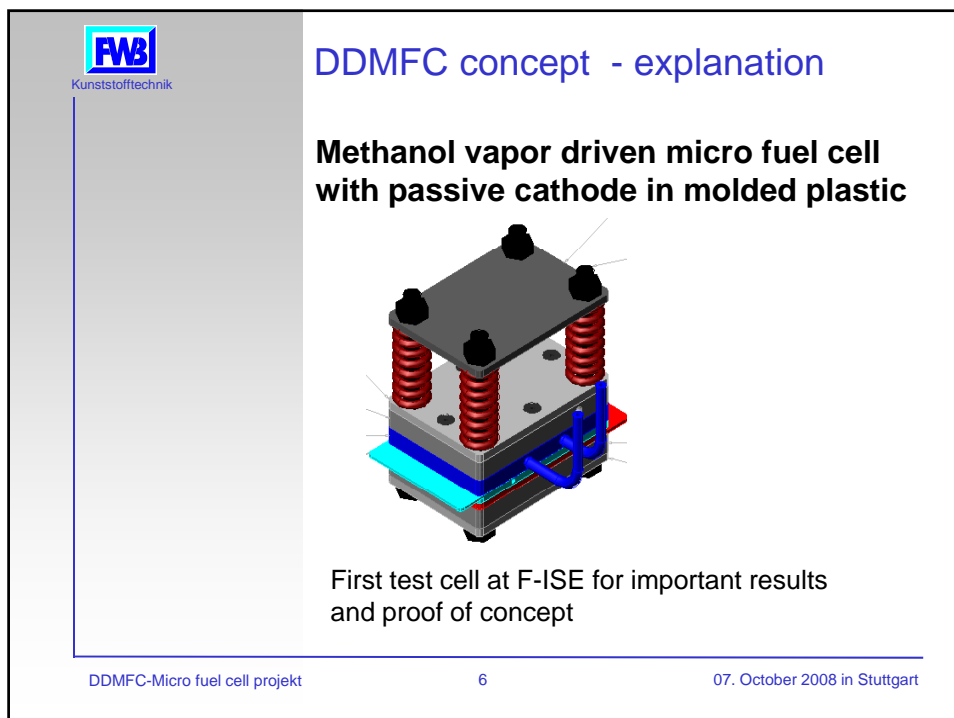
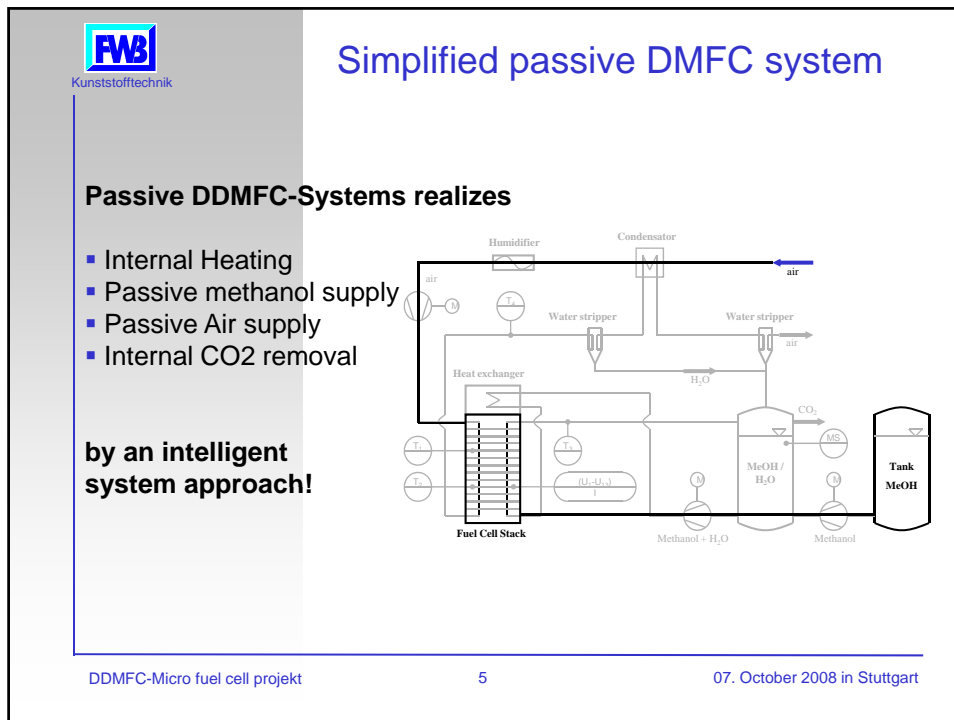
by active peripheral components (sensors, actuators)




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4

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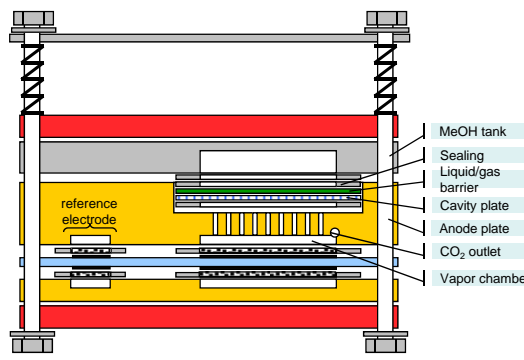




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Test cell with reference electrode


- Reference electrode to quantify anode and cathode losses
- Pressurization of the anode vapor chamber
- Heated endplates
- Constant clamping pressure realized by springs



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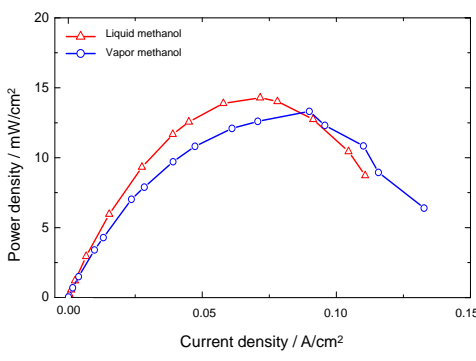
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Comparison of liquid and vapor methanol delivery

■ Test conditions:

- red: 0.5 M liquid MeOH, 1.5 ml/min, air-breathing cathode
- blue: 50wt% vapor MeOH, 6.8% OR, air-breathing cathode

➤ Comparable power density achieved by both delivery methods




Current density / A/cm ²	Liquid methanol Power density / mW/cm ²	Vapor methanol Power density / mW/cm ²
0.00	0	0
0.01	2	2
0.02	5	5
0.03	8	8
0.04	11	10
0.05	13	12
0.06	14	13
0.07	14.5	13.5
0.08	14	13
0.09	12	11
0.10	10	9
0.11	8	7
0.12	6	5

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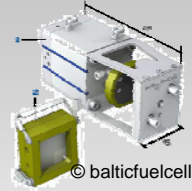
8

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DDMFC measurement cell




© balticfuelcell

- simple MEA change
- Homogeneous contact pressure Parameter field:
 - Cathode opening
 - Anode opening
 - external conditioning (RF, T)
 - Tempering (RT-60°C)
- External refillable liquid storage (>10 mL)
- 5 DDMFC measurement cells to the component development Partners:
 - HIAT; F-ISE; FuMA-tech; Solvicore; SGL



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9
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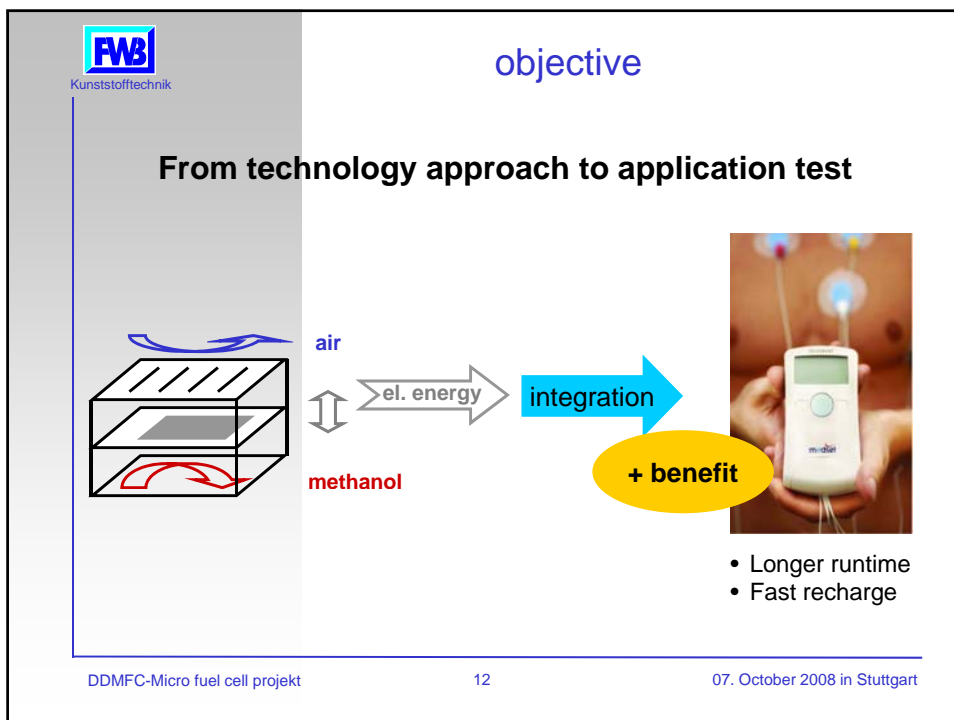
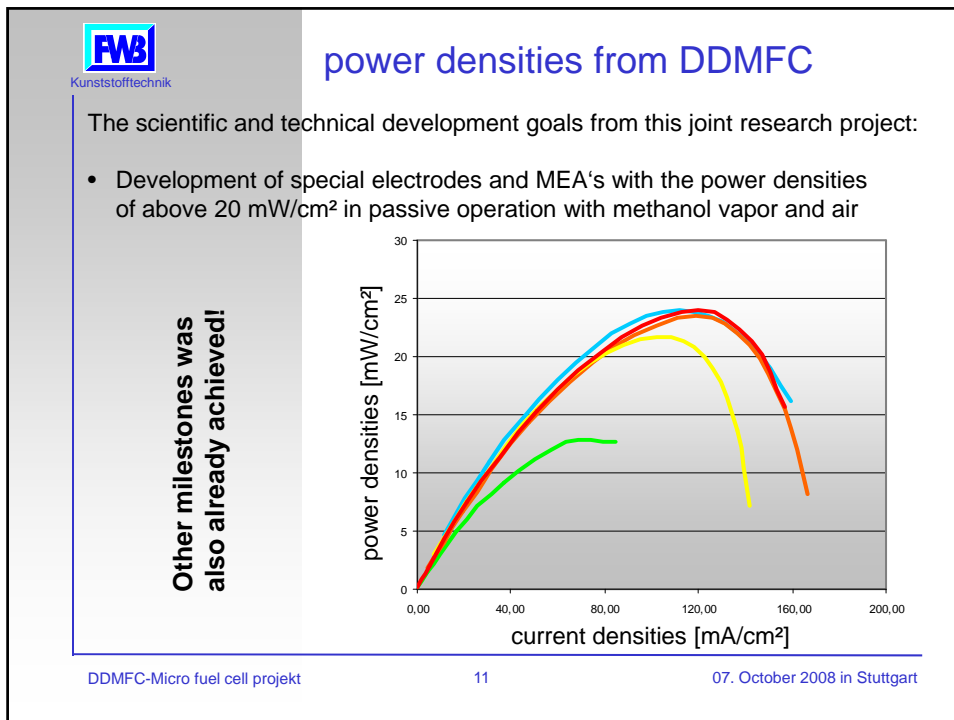
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Parameter studies

Quantification of the influence of

- Membrane thickness
- Catalyst loading
- Methanol concentration
- Air flow rate
- Cell temperature
- Gas diffusion layers
- Opening ration of evaporator

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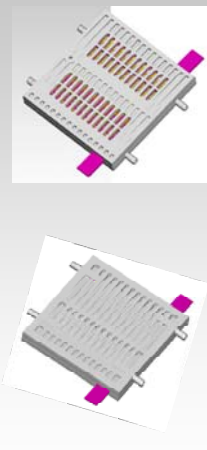




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Summary

Advantages of passive vapor fed DMFC systems




- Gaseous methanol for improved diffusive reaction kinetics
- Neat methanol for highest energy density
- Improved mass transport without 2-phase-problem
- Avoiding peripherals (BoP) => higher efficiency
- Injection-molding technology for series production
- Flat planar construction for device integration

Prototype under development for 2009

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13

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Acknowledgement

the projekt team(s)

- DDMFC in total
- at FWB in Pirmasens
- at F-ISE in Freiburg

Thanks to sponsorship from:



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14

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Development and construction of plastic parts • Quality management
Tool manufacture • Production from plastic parts by injection molding

planar micro fuel cells

Coordination:

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Thank you
for the attention!

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questions?

Innovation in plastics