



Organic Thermogenerators for Energy Autarkic Systems

Institut für Mikrotechnik Mainz GmbH



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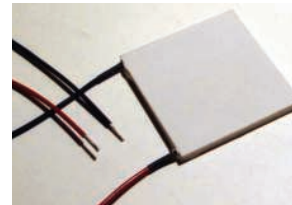
BACKGROUND and BASICS

Standard Thermogenerators (TGs)

- are rigid,
- have a small active area
- and are expensive (€/Wm²).

Heat waste is often emitted on large curved areas, i.e. desirable features of future TGs are

- large area covering
- flexibility in surface shape
- fabrication by means of mass production (cheap)



www.thermalforce.de



Kawa Isoliertechnik GmbH

CONCEPT and SOLUTION

Thermogenerators:

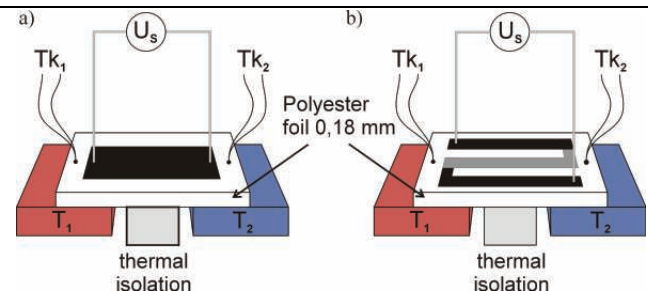
Junctions of p- and n- type semiconductors/metals transform a temperature difference into a usable voltage

Organic semiconductors

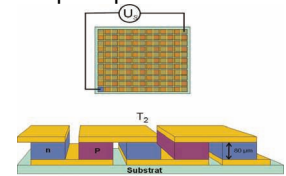
- show acceptable thermoelectric properties and
- can be processed by screen printing
- even on flexible substrates (foils)
- with a medium integration density.

Estimated Performance @ dT=5K:

- 6 x 6 cm², 1.5 V, 1.5 μW
- 20 x 20 cm², 2.7 V, 26 μW
- 20 x 80 cm², 2.7 V, 105 μW



Operation principle



3D design concept

STATUS and OUTLOOK

Performed Works:

- Material screening of organic charge-transfer salts ✓
- Incorporation in printing pastes ✓
- Screen printing of 2D test structures ✓
- Proof of principle ✓
- Wuesten, Potje-Kamloth, J. Phys. D 41(2008)p.135113 ✓

Next steps:

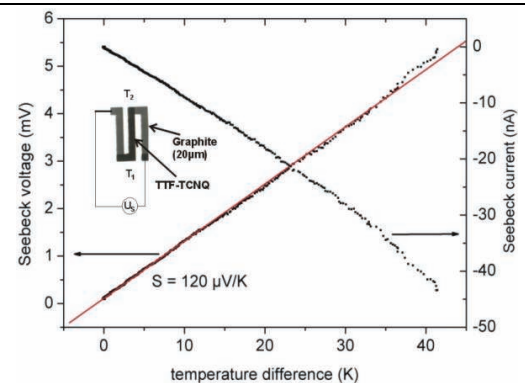
Transfer into industrial reel-to-reel processes → BMBF project "OTEPS" (estimated start in autumn 2009, Partner Fraunhofer IZM München)

Future developments: "energy autarkic sensor nodes"

Integration with energy storage, sensors, organic electronics, organic RFID, flexible display

Application fields:

- building automation systems, personal healthcare, large area energy harvesting, wearable electronics



Seebeck voltage vs. temperature difference



Reel-to-reel process (Fraunhofer IZM, München)

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