

PyzoFlex[®]

An award winning, printed & flexible sensor technology for dynamic sensing of pressure/temperature changes as well as energy harvesting

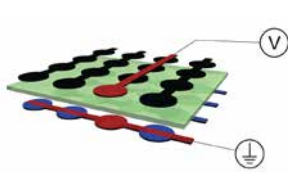


Advantages

In various applications PyzoFlex® sensors show a range of unique advantages such as:

- Printability
- Scalability (large Area)
- Cost Efficiency
- Flexibility
- Freedom of Substrates & Design
- Robustness
- High dynamic detection
- Energy Self-Sustaining
- Spatial Resolution

Applications



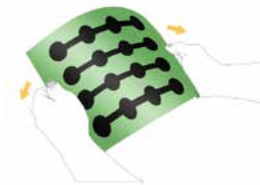
Energy harvesting

- Body movement
- Vibration
- Temperature changes
- Deformation
- Wind



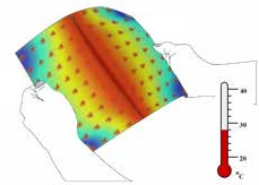
Pressure sensing

- Membrane Keyboards
- Impact Detection
- Touch Interface
- Smart Surface/Floor
- Switch
- Security System
- Ambient Assisted Living



Flexible Sensors (bending)

- Flexible Displays
- Gaming
- Collaborative Robotics
- Wearable Consumer Electronics
- Smart Skin



Temperature sensing

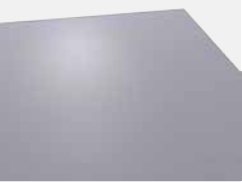
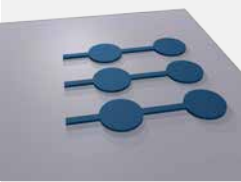
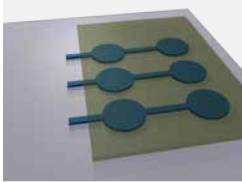
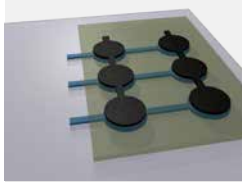
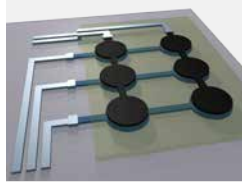
- Laser Safety Systems
- IR-Detector
- Touchless Interaction
- Human Body Radiation

Key Facts: Sensor

Technology	Principle	Figure-of-Merit	Parameter
Piezoelectric-Pyroelectric sensing (active)	$\Delta Q \rightarrow \Delta I, \Delta V$ Charge generation	Piezoelectric Coefficient $d_{33,31} = \Delta Q/F$ Pyroelectric Coefficient $P = \Delta Q/\Delta T$ ($\Delta I, \Delta V = S * \sigma$)	Dynamic Pressure/Temperature, Strain, Vibration, Ultrasound Transducer, Accelerator, ...

Key Facts Sensor		
Pyroelectric Coefficient p	20 – 30 $\mu\text{C}/\text{m}^2\text{K}$	Depending on polymer composition & crystallinity
Piezoelectric Coefficient d_{33}	-25 – -38 pC/N	Depending on polymer composition & crystallinity
Remnant Polarization	60 – 75 $\mu\text{C}/\text{m}^2$	Depending on fabrication process
Coercive Field	50 MV/m	
Curie Temperature	120°C – 140°C	Depending on polymer composition

Standard fabrication process by screen-printing

Substrate	1 st Electrode	Active Material	2 nd Electrode	Connections
				
Plastic, paper, textile, glass, metal, transfer foils ...	PEDOT: PSS (conductive, transparent polymer)	Copolymer: PVDF:TrFE-Ink (patented ink formulation)	PEDOT:PSS (for semi-transparent sensors) Carbon	Ag lines for connection to read-out electronics

Key Facts: Sensor-Fabrication

- Low temperature fabrication on flexible/rigid substrates ($\leq 100^{\circ}\text{C}$)
- Substrate sizes up to 420 x 420mm with a thickness $\leq 20\text{mm}$
- Semi-transparent sensors if solely PEDOT:PSS is used as electrode material
- Cost efficient sheet to sheet manufacturing by industrial screen printing process
- Application specific sensor shapes based on CAD designed screen masks (max. resolution = 12000dpi)
- Feature sizes down to 100 μm (depending on material and screen)

Key Facts: Printing Equipment

- Thieme LAB 1000
- Alignment accuracy: (\pm) 10 μm
- Full camera alignment
- High reproducibility due to software control
- Monitoring of printing parameters
- Process transfer to industrial lines



The PyzoFlex[®]-DemoKit

PyzoFlex[®]-DemoKit is a learning by doing tool for interested customers to explore the unique advantages and possibilities of the PyzoFlex[®] technology. The single channel readout electronics facilitates data acquisition and storage at high sampling rates (up to 1kHz).



The PyzoFlex[®]-DemoKit includes:

- different PyzoFlex[®] sensors
(customized sensors can be fabricated on request)
- a thermally conductive adhesive patch
(e.g. for the measurement of excess heat of instruments or temperature changes in pipes)
- demo electronics consisting of an analog and a digital part
- a touch interface
- a USB connector for power supply and data transfer
- a PC software to display and log the generated data
- user manual

PyzoFlex[®]

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