

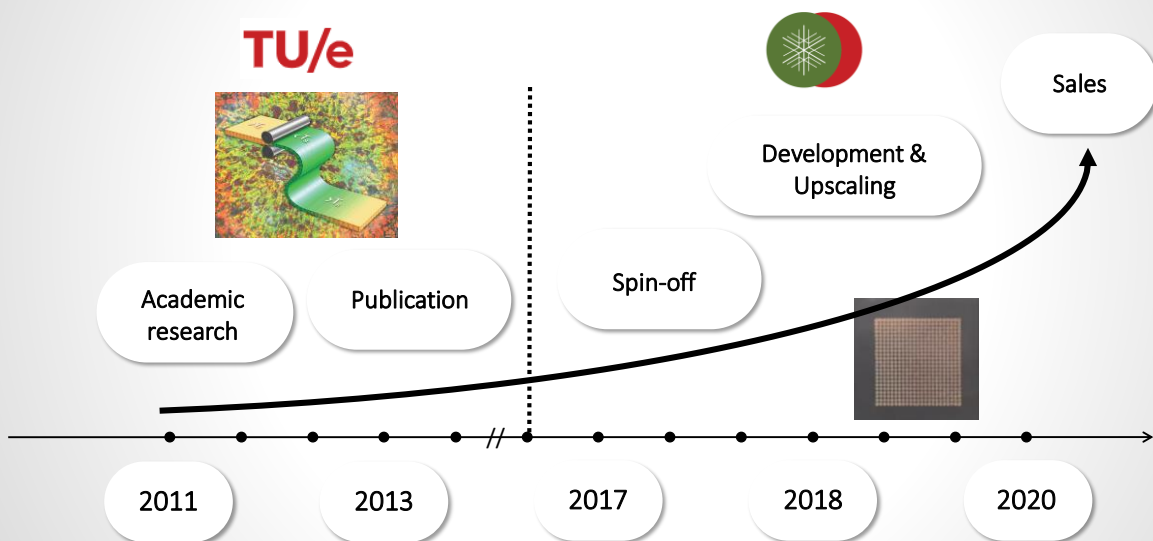


**slimme stickers tegen
voedselverspilling**

Koen Nickmans
FreshStrips | CEO

"The food safety indicator that FreshStrips developed is a great example of how chemistry based technology can make our lives easier and better." - Prins Constantijn der Nederlanden

Road to commercialization



Eindhoven University of Technology (TU/e)



DEPARTMENTS

- Mathematics & Informatics
- Applied Physics
- Chemical Engineering & Chemistry
- Electrical Engineering
- Mechanical Engineering
- Biomedical Engineering
- Industrial Engineering & Innovation Sciences
- Architecture
- Industrial Design

10766 Students

66,5 % Dutch

33,5 % International
> 80 nationalities

~ 3200 employees
~ 2000 academic staff

2315 scientific publications

234 PhD defenses

Top-ranking Dutch University

Figures 2016

Eindhoven University of Technology (TU/e)

Chemical Engineering & Chemistry

Chemical and Process Technology

- Membrane Materials & Processes (MMP)
- Multiphase Reactors (SMR)
- Chemical Reactor Engineering (SCR)
- Inorganic Materials Chemistry (IMC)

Molecular Systems and Materials Chemistry

- Molecular Science and Technology (MST, SMO)
- Materials and Interface Chemistry (SMG)
- Bio-organic Chemistry (BOC)
- Physical Chemistry (SPC)
- **Stimuli-responsive Functional Materials & Devices (SFD)**

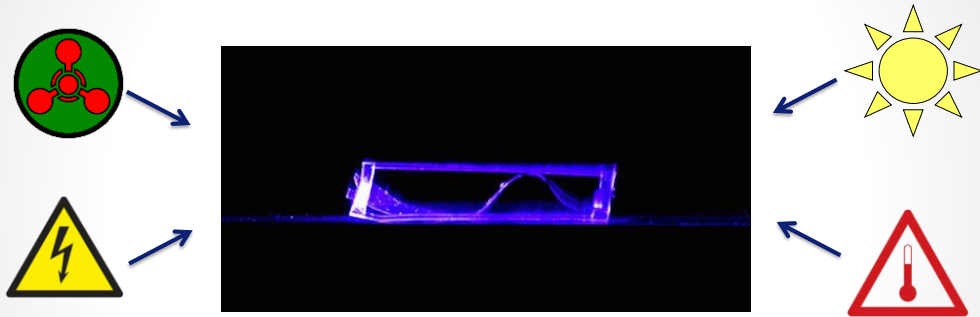
Stimuli-responsive Functional Materials & Devices

Prof. Albert Schenning

Prof. Dick Broer
Dr. Cees Bastiaansen
Dr. Michael Debije
Dr. Danqing Liu
Dr. Owain Parri - Industrial advisor (Merck)
Dr. Theo Hoeks - Industrial advisor (Sabic)
Dr. John Severn - Industrial advisor (DSM)
Prof. Guofu Zhou – Scientific advisor (DIRM)

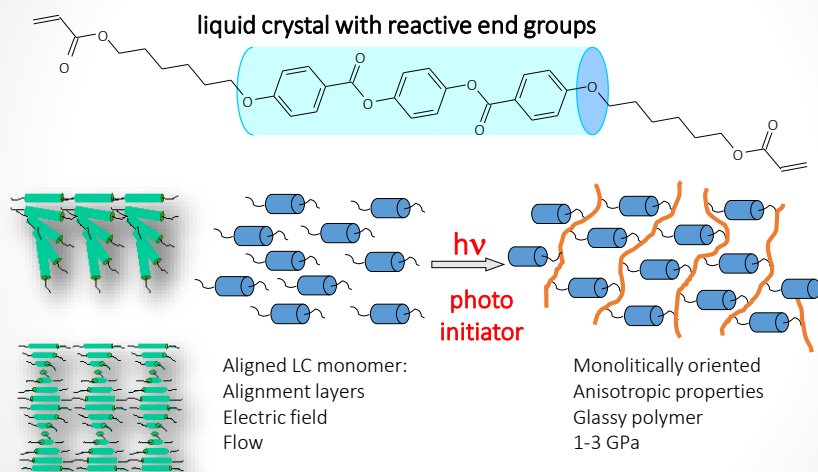


Stimuli responsive materials & devices (TU/e)

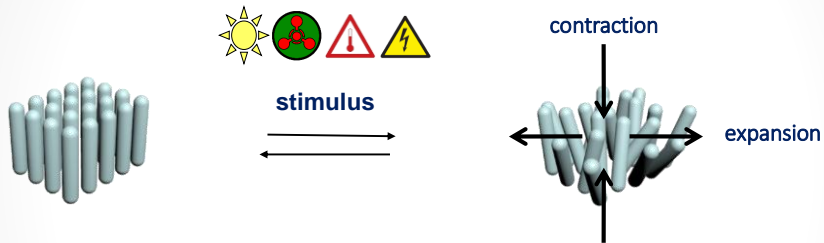


- Focus on polymer materials that change shape, color and/or porosity
- External triggers: chemicals, temperature, (sun)light, electricity, etc
- Adjustment autonomously depending on user needs or upon environmental changes

Stimuli responsive materials & devices (TU/e)



Stimuli responsive materials & devices (TU/e)

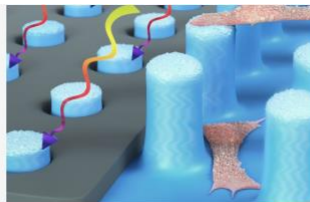


- Response is caused by a small reversible change of the local molecular order, solvents are not needed
- Disorder is induced by triggering molecules that respond to temperature, humidity, light, and/or chemicals (among others)

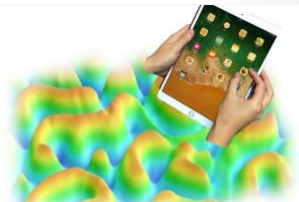
Stimuli responsive materials & devices (TU/e)



Sustainable Energy



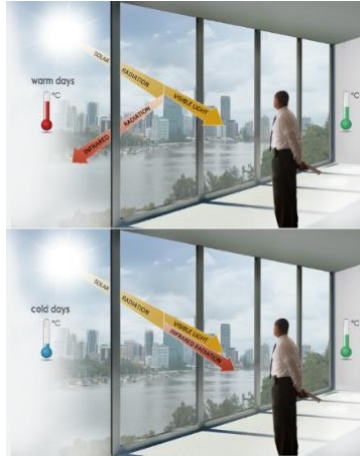
Health



Personal Comfort

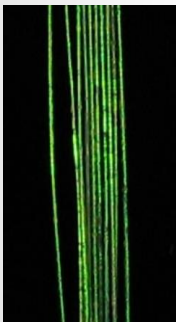
Sustainable energy (TU/e)

Smart coatings for anti-fouling and self-cleaning
Luminescent solar concentrators and smart windows

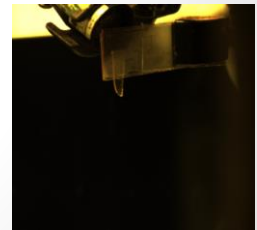
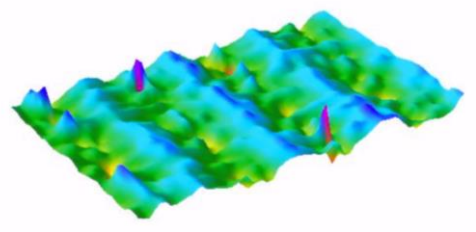
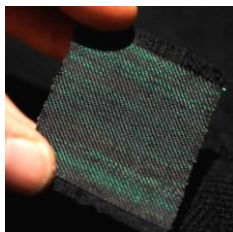


Personal comfort (TU/e)

Smart Textiles, Soft Robotics, Haptics

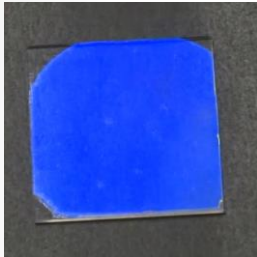


Fibers woven into textile



Health (TU/e)

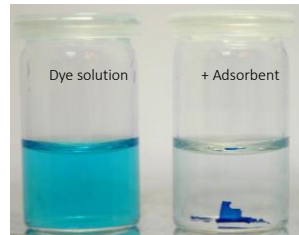
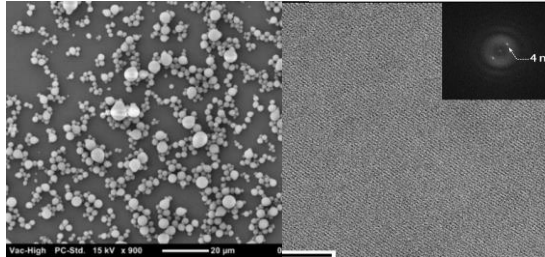
Food, Optical Sensors, Membranes, Clean water



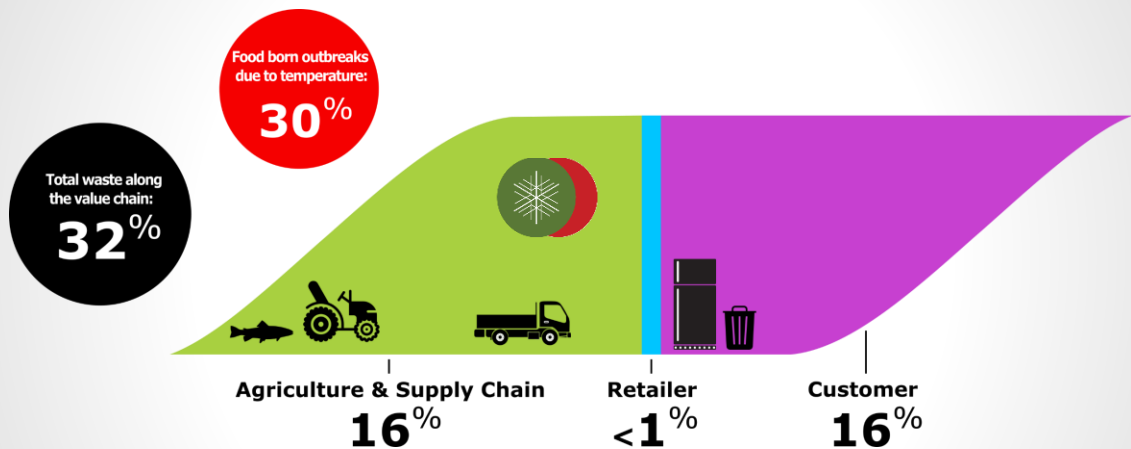
Battery free, Printable on a foil



time-temp. (vaccines, food)
calcium (osteoporosis)
humidity, CO₂, O₂
amines (rotten fish), methanol (wine), strain



Food waste and food safety



10% of all food waste occurs inside the supply chain (FAO)
30% of food borne outbreaks are due to temperature (EU)

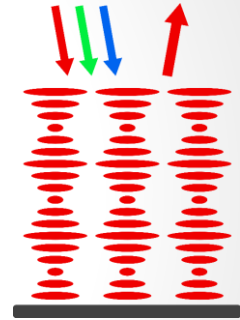
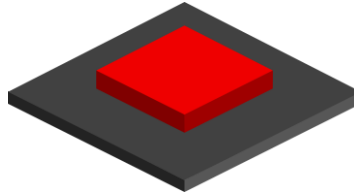
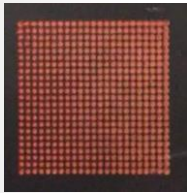
Fresh Strips track temperature history during transportation



Fresh Strips track temperature history during transportation

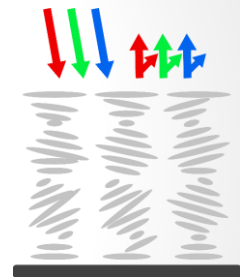
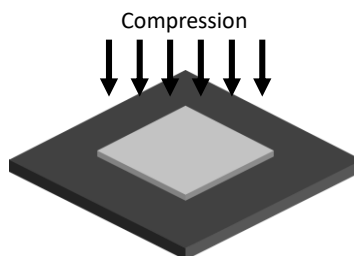
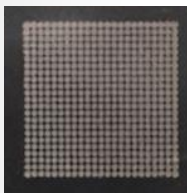


Fresh Strips are nanostructured sensors



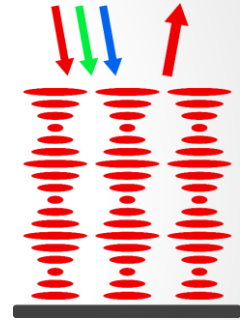
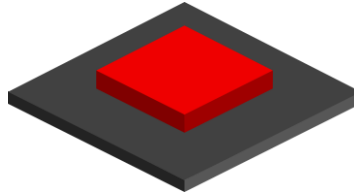
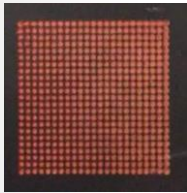
Polymeric nanostructured coating: **reflective red colour**

Fresh Strips are nanostructured sensors



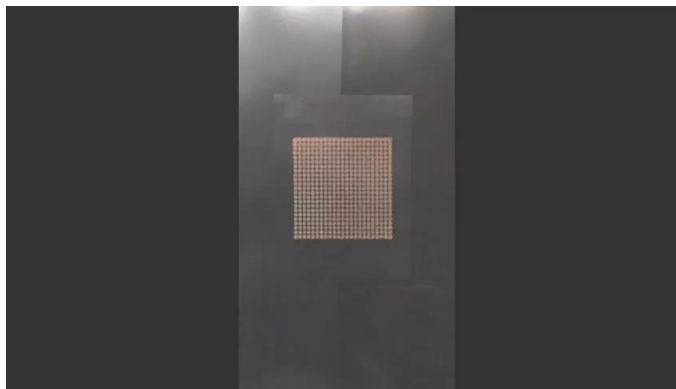
Activation by compression: **matte grey colour**

Fresh Strips are nanostructured sensors








Heat induced shape recovery: **reflective red colour**

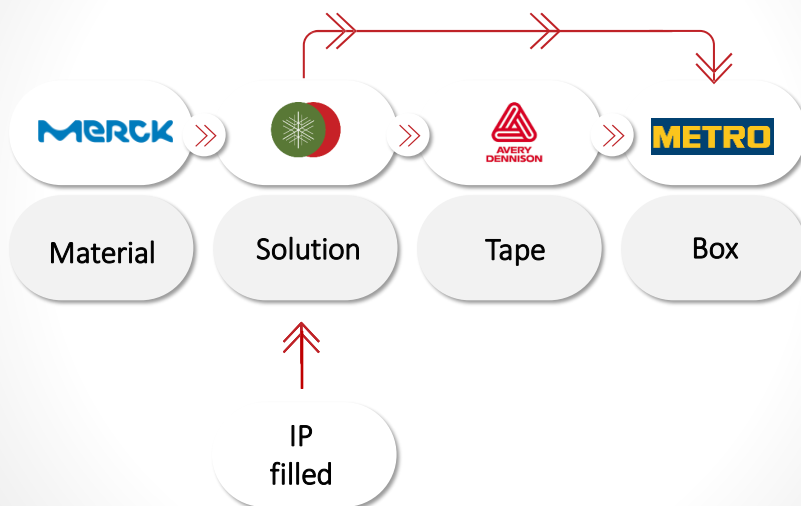
Demo video of Fresh Strip on a hot plate rapidly changing color



20% price & distinct coloring

					
Easy-to-Read	×	✓	✓	✓	✓
Distinct coloring	×	×	×	×	✓
Price	×	×	×	×	✓
	€25.5	€1.71	€1.55	€0.20	<€0.02

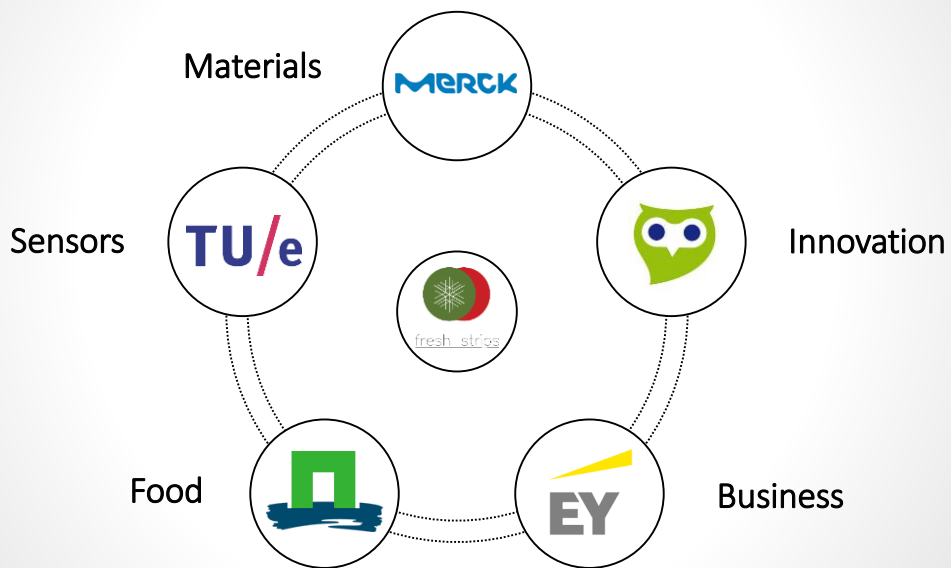
Smart packaging market to double by 2019 to \$21.41B



Team: Materials, Food, & Business



Partnerships across the value chain



> 6 Awards

Merck Displaying Futures Award



Best Dutch Chemistry Startup 2017



Hellenic Entrepreneurship Award (1250 applicants)



1st MIT EF Startup Competition



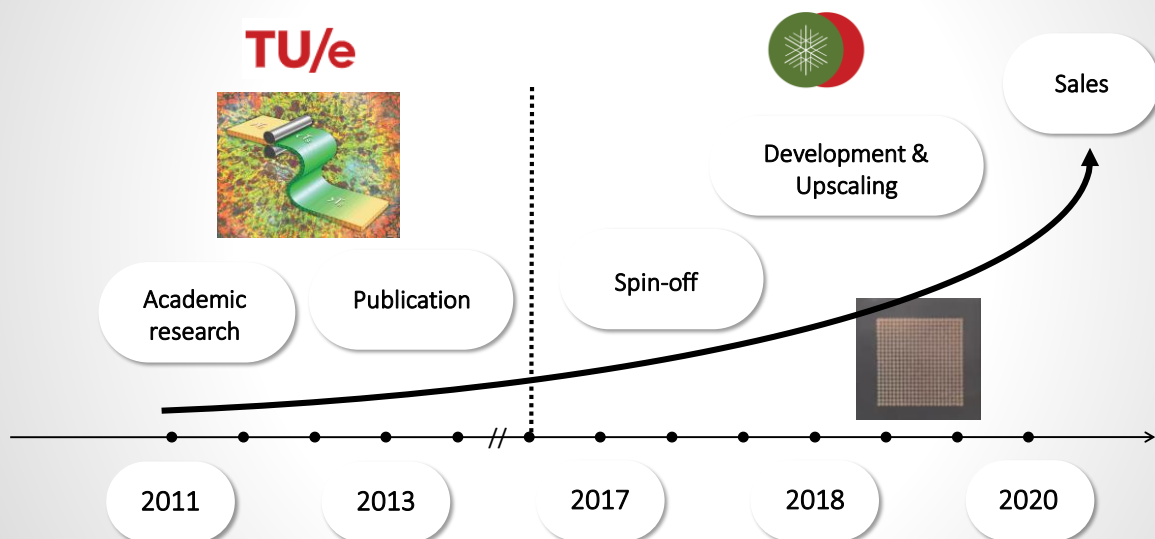
Top 5 SPIE California

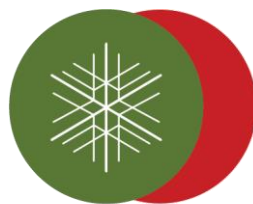


1st Get in the Ring Netherlands (300 applicants)



Road to commercialization





fresh strips

"The food safety indicator that FreshStrips developed is a great example of how chemistry based technology can make our lives easier and better."

- Prince Constantijn of the Netherlands

Thank you!