

Digital Manufacturing Technologies for the Development of Smart Sensors and Electronics for Agro-industrial Systems

www.digiman-project.eu

PROJECT SUMMARY AND APPROACH


The **DigiMan** Project (December 2018 – November 2020) develops innovative sensor platforms for agro-industrial applications by providing a digital manufacturing process chain based on printing technologies and nanomaterial inks. This makes it possible to miniaturize the sensors, to achieve a flexibility in the target sensor properties and to realize these sensors in economically low cost even for small sensor batch quantities.

The project will demonstrate miniaturized gas sensors with printed platinum heater on thin and mechanical flexible zirconia substrates with low power consumption. Low-cost temperature and humidity sensors are printed with silver and copper inks on flexible PET and paper substrates. For a wireless communication of these sensors, a Bluetooth communication board with an inkjet printed silver antenna and inkjet printed RFID sensor tag are developed.

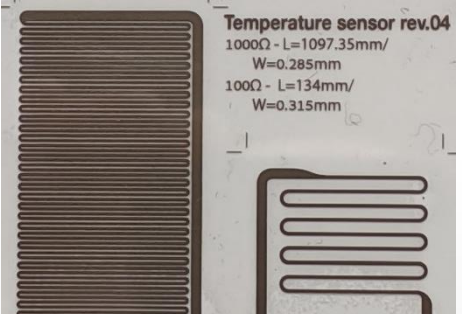
DigiMan CAPABILITIES

- Silver, copper, platinum inks with nanoparticles < 200 nm and solid content up to 50 wt.-%
- Extreme thin and mechanically flexible zirconia substrates of 20 to 40 μm thickness
- Metal oxide inks for gas sensing, e.g. methane, hydrogen and carbon monoxide
- Digital printing technologies of inkjet and aerosol-jet, scaling R2R
- Miniaturized printed Pt-heater on thin zirconia for low power consumption (< 200 mW)
- Metal-oxide semiconductor gas sensors (MOX) based on ceramic technologies (ceramic MEMS)
- Digital printed humidity and temperature sensors on low-cost PET and paper substrates


DigiMan MIDTERM RESULTS



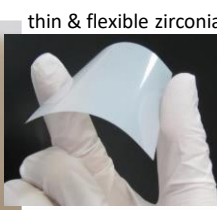
Humidity and temperature sensor: inkjet Sicrys™ silver ink



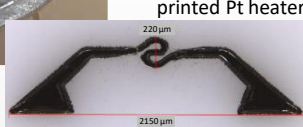
Temperature sensor rev.04
 1000Ω - L=1097.35mm/
 W=0.285mm
 100Ω - L=134mm/
 W=0.315mm



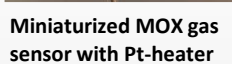
ceramic SOT-23 package



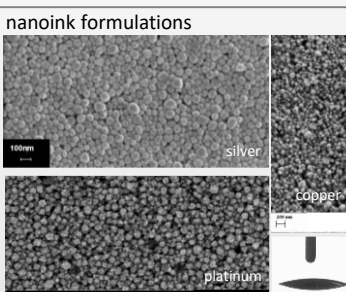
thin & flexible zirconia




printed Pt heater




Miniaturized MOX gas sensor with Pt-heater



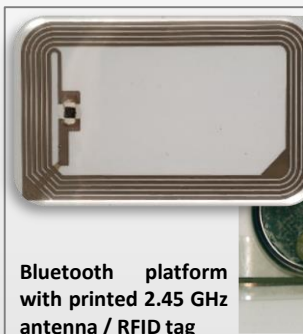
nanoink formulations
 silver
 copper
 platinum



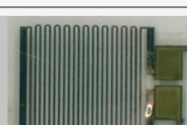
flexible ceramics




Nanoparticle inks for inkjet and aerosol-jet printing



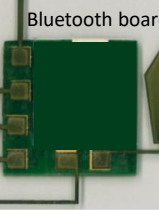
Bluetooth platform with printed 2.45 GHz antenna / RFID tag




temperature sensor



battery

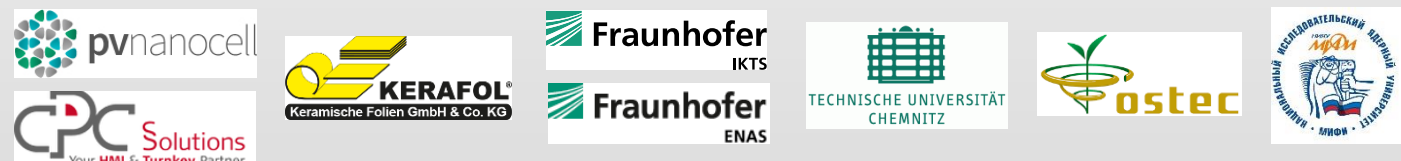


Bluetooth board



Inkjet printed Ag antenna

PARTNERS



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