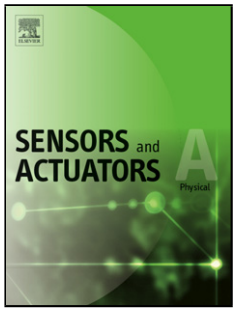

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Feasibility of RF Energy Harvesting for Wireless Gas Sensor Nodes

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Highlights

- This work explores an RF energy harvesting system for wireless gas sensor nodes with two gas sensor types: electrochemical CO sensors which do not practically need energy and catalytic sensor for CH_4 detection which is one of the highly energy-consuming sensors. The gas sensor nodes are designed to work in wireless senor networks and powered by RF energy at a frequency of 900 MHz and in the -20 dBm to 10 dBm power range. We evaluate the energy budget required to support the sensor measurement and data transmission in continuous mode.
- The related research in the area of RF energy harvesting is overviewed and the challenges concerning the use of this type of energy harvesting technique for wireless gas sensors are outlined.
- The supercapacitor was chosen as an energy storage medium. The rectifier output voltage and charging time of the supercapacitor at different RF input power levels were measured. The maximum and minimum energy values necessary for powering the sensors have been evaluated.
- According to the results, the carbon monoxide sensor node can operate over long periods of time when the ambient RF signal is 0 dBm (1mW). The power consumption for the node with CH_4 sensor is too high to operate autonomously. This is due to the high power consumption of the methane sensor during its heating to 400-450 C.
- The RF to DC conversion efficiency is evaluated and it is shown that the peak efficiency is 39% in case of having 0 dBm at the input of the harvesting system.

Abstract