

Low Power Sensor Systems Technologies for Environmental Air-Monitoring

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Abstract

Distributed monitoring of air quality in the environment requires ultra-low power components for autonomous systems. These include the actual transducer, an analog interface, some local processing capability and a wireless connection. To power the system one needs a battery or energy harvester in combination with smart power management. The approximate target is an overall system power of 100 microWatt, which leaves only a fraction of that for (bio-) chemical sensing.

Although a wide range of sensor technologies is available, power consumption of existing technologies is typically high because they require light (e.g. IR for CO₂), heating (metal oxides), etc. Consequently, novel sensing technologies are required that work around these limitations.

Recent developments in this direction include a mems-based electronic nose for volatile sensing that uses piezo-electrics instead of optics for resonance frequency monitoring; metal oxide CO₂/O₂ sensors that operate at significantly lower temperatures (or even room temperature); low power NO_x sensors that operate in the sub-ppb range.

For a few chosen technologies, the sensors are combined with read-out and driver electronics to then implement them in system demonstrators. These are a combination of off-the-shelf components and in-house developments on read-out, wireless and platform approaches.

Keywords: Sensors arrays; Low power sensor systems; bio-chemical sensors; Air quality;