

New Approaches to Chemical Sensing for Application in Environmental Monitoring

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Abstract

There has been considerable research into the development of arrays of partially-sensitive chemical sensors coupled with pattern recognition techniques in order to mimic the sense of smell. The resulting technologies have been of limited success in the field of environmental monitoring and here we briefly consider some of these sensor technologies and their limitations; in term of sensitivity, selectivity, response time, and practical application. Examples of application space for so-called electronic noses are traditionally food and beverages, but are now focussed on the more demanding applications of healthcare and environmental monitoring. A key challenge often faced in the fundamental processing of the signals from an array of sensors. And so we are increasingly looking towards smart sensors some of which are based upon new insights from human and insect olfaction, i.e. bio-inspired solutions to complex classification problems. Such as how to detect low levels of a volatile chemical in a high and varying background: a problem known as odour segmentation in the field of olfaction. Here we show recent work on two novel approaches: an artificial olfactory mucosa based upon the human olfactory system, and an info-chemical communication system based upon insect olfaction deploying a ratiometric principle. These sensor architectures, combined with low cost sensing technologies, may offer a solution to some of the challenges that we face in environmental monitoring today.