Sensing Smells

Wolfgang Knoll

AIT Austrian Institute of Technology, Vienna, Austria

For the sensing of light, e.g., in optical communication, we have extremely powerful devices with the ability to detect even single photons. Similarly, the monitoring of force/pressure, e.g., for sound detection in acoustic communication is technically no problem. Only for chemical communication, for smell or taste detection on a technical level, we have (nearly) nothing. Despite the fact that the monitoring of chemicals in chemotaxis, i.e., the molecules-guided search for food of many organisms or the exchange of chemical cues between species as a way to communicate with each other, is the oldest of our sensory repertoire, we have essentially no technical device that offers the sensitivity and the bandwidth needed to sense and to differentiate many different odors and tastes. Earlier attempts to fill this gap by “artificial noses” failed (with the only notable exception being the “alcohol breath analyser” used by police) mostly because of lack of sufficient sensitivity.
In order to develop and present during this talk concepts for smell sensors that could overcome these sensitivity limits we will very briefly refer first to the world of smells and give a brief introduction into how mammalians and insects smell.
Using a biomimetic approach, i.e., using functional elements (proteins) from nature and combining them with electronic devices for hybrid transducers, we describe novel schemes and read-out concepts for smell sensors.