Monosaccharide-Based Enantioselective Electronic Nose

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Abstract:

Semiconducting single-walled carbon nanotubes (sc-SWCNT) are of great potential for vapor sensing. However, sc-SWCNT lacks recognition features for discriminating between molecules with similar structural features, e.g., enantiomers, and minimal functional groups. This becomes a major setback in discriminating between volatile organic compounds (VOCs). Here, the multichirality and multifunctionality of a monosaccharide scaffold were exploited to compensate for the poor interacting moieties of enantiomeric VOCs. As the acquisition of synthetic oligosaccharides requires the use of carefully designed sMS, the same elements and procedures can be used to produce a library of saccharides with different properties and affinities. We used galactosides decorated with aromatic groups as a recognition layer in chemoresistive sc-SWCNT sensors to produce chiral preference toward three pairs of terpen-derived enantiomers. As demonstrated by a related sc-SWCNT sensor, even seemingly inconsequential alterations to the sMS scaffold can trigger changes in the chemoresistive response. We have only scratched the surface of the numerous synthetically possible combinations of monosaccharides and scaffold modifications. Fine-tuning of VOC binding preferences and enhancement of chiral discrimination can be envisioned by exploring diverse sMSs.

Keywords:

Chemoresistive sensors, enantiomeric discrimination, eNoses, volatile organic compounds.