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Organic bio-electronic sensors for ultra-sensitive chiral differential detection

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The energies involved in weak chiral interactions occurring between Odorant Binding Proteins (OBPs) and Carvone Enantiomers are evaluated, down to a few KJ/mol, by means of a water-gated organic field-effect transistor (WGOFET) whose Au-gate is modified with a porcine-OBP (pOBP) self-assembled monolayer. The output current measured is dependent on the concentration of the analytes and pM concentrations can be detected. The binding curves also are significantly different between the two enantiomers. The modelling of the two curves allows the energies associated with the OBP- Carvone complexes formation to be independently extracted, from the very same set of data. From the dissociation constants the standard free-energy, the complex formation at the electrode is derived, while the threshold voltage shifts gives information on the electrostatic component. This approach, representing a unique tool to quantitatively investigate low-energy bio-chemical interactions, is rather general as it relies on the relative dielectric constants of the protein-SAMs and of the organic semiconductors being much lower than that of water. The role of the OBPs in the olfaction system is still under debate and the detection of neutral odorant species at the pM level by means of a WGOFET adds relevant pieces of information to the understanding of the odor perception mechanism at the molecular level.

Biography

Luisa Torsi is Professor at the University of Bari and elected Vice-President of the European Material Research Society. She received her PhD from the University of Bari and was Post-doctoral fellow at Bell Labs (USA). She was awarded with the Hedrick Emanuel Merck prize for Analytical Sciences. Her principal scientific contributions are in the fields of advanced materials and electronic devices mostly employed for sensing applications. She has more than 200 scientific products, including papers published in *Science and the Nature Family Journals*, gathering over 7000 citations with a HI of 41 (Google scholar).

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