ORGANIC ELECTROCHEMICAL TRANSISTORS

Plastic sensors detect metabolites

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Metabolites such as lactate are an indicator of many health conditions, so their detection is therefore valuable in medical diagnostics. Amperometric biosensors are often used to detect relevant metabolites and work by measuring a current when a voltage is applied between a sensing and reference electrode. The sensors typically rely on enzymes (lactate oxidase, for example) that catalyse the oxidation of the metabolite, a process that can be used to release electrons and generate a current that is proportional to the concentration of the metabolite. However, these sensors require elements to help transfer electrons to the electrodes, which limits the efficiency and speed of the devices. Róisín Owens, Sahika Inal and colleagues have now developed an organic electrochemical transistor that can detect lactate directly and without the need for an external reference electrode.

The researchers — who are based at the University of Cambridge, King Abdullah University of Science and Technology in Saudi Arabia, Imperial College London and Northwestern University in Chicago — used an n-type polymer that is coupled to the enzyme lactate oxidase and placed at the gate electrode and the channel of the transistor. With this setup, electrons created from the enzymatic reaction can flow directly into the channel. Furthermore, the transistor operates in accumulation mode and has signal amplification properties thanks to its n-type active material. In a series of sensing tests, the device was able to detect a wide range of lactate concentrations from 10 μM to 10 mM.

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