MICROFLUIDIC CHIPS COUPLED TO NANOMATERIAL-BASED ELECTROCHEMICAL DETECTION

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Microfluidic chips (MC) require short time analysis and extremely low biological sample quantities in order to perform an analysis. Electrochemical detection coupled to MC is a valuable detection mode that provides inherent sensitivity, permits miniaturization, and is highly compatible with micro- and nanotechnologies.

As an important block in nanotechnology, 1-D nanomaterials (NMs) are structures with only one dimension extend being very unique, not only because they offer a high surface to volume ratio, but also because they can easily be designed and fabricated with tunable electronic properties and controlled functionality. Two relevant examples include carbon nanotubes (CNTs) and metallic nanowires (MNWs).

When NMs are used as electrochemical detectors in MC, these NMs can significantly improve chip analytical performance. The scale of nanomaterials is highly compatible with the MC scale, providing high currents in the measurement due to their large surface areas of NMs, thereby enabling large-scale redox conversion, which increases the analytical selectivity and sensitivity as well as the resistance to passivation of NMs yielding very good reproducibility.

Because of the extremely low sample volumes introduced into MCs, sensitivity is often low and represents the main drawback of these systems, however, this sensitivity can be enhanced and the problem can be overcome by exploiting the surface characteristics of these nanomaterials, becoming, consequently, the MC-NMs coupling very pertinent for a novel generation of MC.

In this communication, towards selected analytical applications in food and clinical areas, the analytical potency of CNTs and MNWs for electrochemical sensing on MCs will be addressed.

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