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Nanotechnology in design of screen-printed sensors and biosensors for environmental and clinical applications

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The development of screen printed sensors and biosensors for electrochemical detections are significant areas of modern chemical analysis because of their wide practical, clinical and environmental applications. In many cases those portable sensing devices can replace much more complex and expensive analytical instrumentation for direct use by patients for personal monitoring of live functions, or for field tests of environmental pollution. For the needs of different electrochemical detections, from different electrode materials there are printed 2-3 electrode strips, but also electrode arrays with larger number of single electrodes. Screen-printed electrochemical sensors are already being widely used for monitoring of e.g., metal pollutants and also for the fabrication of biosensors for applications in environmental and food analysis. The screen-printed technology of the production of electrochemical sensors, for all mentioned fields of application, offers the important features such as miniaturization of the measuring setups, a low cost of mass production, easy procedures of the use and also the possibility of the use of such devices with the small sample volumes. Since pioneering work, a particular progress in their development in the recent decade was brought by the application of carbon and metallic nanomaterials, as well as oxide and composite ones. The proper selection of type of nanomaterials employed and method of their deposition on the surface of screen-printed electrodes, in many cases can substantially enhance their selectivity and sensitivity and in some cases the response time. This concerns chemical sensors and also the enzymatic biosensors, immunosensors, aptasensors and genosensors. This contribution presents the progress gained in recent years in design of sensors used with voltammetric, potentiometric and impedimetric detections.

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