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Electrochemical methods for nanotoxicity assessment

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HIGHLIGHTS

- We review state-of-the-art analytical methodologies for nanotoxicity assessment
- We outline the potential of electrochemistry to measure nanoparticle effects
- We highlight promising potential applications of electrochemistry to nanotoxicology
- We discuss future research needs and opportunities in nanotoxicity assessment

ABSTRACT

The exponential increase of consumer goods containing nanoparticles (NPs) requires a comprehensive assessment of the risks associated with the use of these materials. Given the large number of nanotechnology products that require evaluation, there is a need to expand the repertoire of accessible nanotoxicity-measurement technologies to accelerate testing and screening of nanomaterials and their effects on the environment and biological systems.

This article provides an overview of electrochemical approaches that can be used for risk assessment for nanotechnology. These include:

- (1) electrochemical quantification of potential nanotoxicity makers;
- (2) microelectrodes for real-time *in-situ* profiling of biochemical and physiological changes in cells, tissues and organs exposed to NPs; and,
- (3) electrochemical methods as screening tools for particle reactivity, dissolution behavior, catalytic properties and physicochemical parameters in various exposure scenarios.

We cover potential applications and provide a critical discussion of future research needs and opportunities in nanotoxicity assessment.

Keywords:

Electroanalytical evaluation

Electrochemical method

Electrochemistry

Microelectrode

Nanoparticle

Nanoparticle exposure

Nanotoxicity

Nanotoxicity assessment

Oxidative stress

Risk assessment

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