Electrochemical detection of arsenite using a silica nanoparticles- modified screen-printed carbon electrode

ABSTRACT

Arsenic poisoning in the environment can cause severe effects on human health, hence detection is crucial. An electrochemical-based portable assessment of arsenic contamination is the ability to identify arsenite (As(III)). To achieve this, a low-cost electroanalytical assay for the detection of As(III) utilizing a silica nanoparticles (SiNPs)-modified screen-printed carbon electrode (SPCE) was developed. The morphological and elemental analysis of functionalized SiNPs and a SiNPs/SPCE-modified sensor was studied using field emission scanning electron microscopy (FESEM), transmission electron microscopy (TEM), energy dispersive X-ray spectroscopy (EDX), and Fourier transform infrared spectroscopy (FTIR). The electrochemical responses towards arsenic detection were measured using the cyclic voltammetry (CV) and linear sweep anodic stripping voltammetry (LSASV) techniques. Under optimized conditions, the anodic peak current was proportional to the As(III) concentration over a wide linear range of 5 to 30 µg/L, with a detection limit of 6.2 µg/L. The suggested approach was effectively valid for the testing of As(III) found within the real water samples with good reproducibility and stability.

Keyword: Arsenite; Electrochemical sensor; Screen-printed carbon electrode; Silica nanoparticles