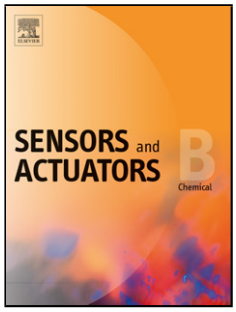

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Quantitative Butyrylcholinesterase Activity Detection by Surface-Enhanced Raman Spectroscopy

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Highlights

A new SERS-substrates based on silver paste were developed for sensitive quantification of butyrylcholinesterase activity. These SERS-substrates can be applied for low-molecular substances determination and for enzymatic activity detection both in model systems and in spike solutions with plasma. Limit of detection for TCh is 260 nM. Advantages of the new technique: it is label-free, inexpensive and has the possibility to routine measurements of hundreds sample. SERS-substrates are stable at least 1 month.

Abstract

The butyrylcholinesterase activity in human blood is an important marker of healthiness. Either level of this enzyme – increased or otherwise – can indicate disease or intoxication. The most popular technique to assess the cholinesterase activity is the detection of thiocholine, a product of enzymatic hydrolysis of butyrylthiocholine. In this work, Ag-paste was used as SERS-substrate and a new technique was created for thiocholine detection. As explained below, the designed technique facilitates also determination of butyrylcholinesterase (BChE) activity both in the buffer and in spike solution with human plasma. Ellman's assay was used as a reference method, a good correlation between spectrophotometric detection and Raman detection was shown.

Keywords: butyrylcholinesterase; thiocholine; butyrylthiocholine; Raman spectroscopy; silver SERS-substrate; PLS regression.