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Ion Transfer Stripping Voltammetry for the Detection of Nanomolar Levels of Fluoxetine, Citalopram, and Sertraline in Tap and River Water Samples

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ABSTRACT

The ion transfer stripping voltammetry (ITSV) technique is used to detect selective serotonin reuptake inhibitors (SSRIs) such as fluoxetine (Prozac[®]), citalopram (Celexa[®]), and sertraline (Zoloft[®]) in drinking and river water. These are common antidepressants that become highly toxic contaminants when they get into the drinking water. In this work we applied ITSV to detect the SSRIs in their cationic form at nanomolar concentrations using a sensitive, inexpensive, and disposable pencil lead electrode with a lower limit of detection of 35, 45, and 25 nM for fluoxetine, sertraline, and citalopram, respectively. The pencil lead was modified by an electrochemically deposited 3, 4-ethylenedioxythiophene (PEDOT-C₁₄) conductive polymer layer and then dip coated with a plasticized poly(vinyl chloride) (PVC) membrane. The PVC/PEDOT-C₁₄-modified electrode was operated in the stripping voltammetric mode. It had a linear current response between 100 nM and 1000 nM for fluoxetine, sertraline, and citalopram, respectively, in tap and river water samples. Importantly, the measurements with the membrane-coated electrode provided information on the lipophilicity of these antidepressants, thus contributing to a better understanding of their environmental toxicity and the risks they pose to humans.

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