Sažetak

Razvoj i konstrukcija potenciometrijskog mikrosenzora za tenzide

Priređena su dva potenciometrijska senzora za anionske tenzide (AS) zasnovana na ionskom asocijatu dimetildioktadecilamonijevom tetrafenilboratu (DDA-TPB) kao novom senzorskom materijalu.

Senzor na bazi polimerne tekuće membrane (PMS senzor) ispoljio je Nernstovski odziv za natrijev dodecilsulfat (NaDDS, 59,0 mV/dekada aktiviteta) i za natrijev dodecilbenzensulfonat (NaDBS, 59,0 mV/dekada aktiviteta) u području $3 \cdot 10^{-7}$ do $8 \cdot 10^{-3}$ M za NaDDS i $4 \cdot 10^{-7}$ do $2 \cdot 10^{-3}$ M za NaDBS. Granica detekcije za oba AS, NaDDS i NaDBS iznosi $2 \cdot 10^{-7}$ M.

Screen-printed mikrosenzor (SPMS mikrosenzor) ispoljio je sub-Nernstovski odziv za natrijev dodecilsulfat (NaDDS, 50,2 mV/dekada aktiviteta) i za natrijev dodecilbenzensulfonat (NaDBS, 45,7 mV/dekada aktiviteta) u području $2 \cdot 10^{-7}$ do $7 \cdot 10^{-3}$ M za NaDDS i $1 \cdot 10^{-7}$ do $2 \cdot 10^{-3}$ M za NaDBS. Granica detekcije za oba AS, NaDDS i NaDBS, iznosi $1 \cdot 10^{-7}$ M. SPMS mikrosenzor odlikuju visoka osjetljivost, točnost, selektivnost, brzina, jednostavnost kao i niska cijena.

Različite pH vrijednosti, ionske jakosti i najčešće korišteni neionski tenzidi, organski i anorganski anioni nemaju značajan utjecaj na karakteristike i performanse senzora, kao i na točnost određivanja. Senzori su uspješno primijenjeni za određivanje AS u tri komercijalna detergenta različitog sadržaja AS, kao i u više uzoraka otpadnih voda različitog nivoa koncentracija AS.

Ključne riječi: tenzidni senzor, anionski tenzid, potenciometrijska titracija, *screen-printed* mikrosenzor, PVC membrana, komercijalni proizvodi, otpadne vode

Summary

The development and construction of a potentiometric surfactant microsensor

The two potentiometric sensors for anionic surfactants (ASs) were prepared, based on the dimethyldioctadecylammonium-tetraphenylborate (DDA-TPB) ion pair as a new sensing material.

The conventional polymer membrane based sensor (PMS) exhibited a Nernstian response for sodium dodecyl sulfate (NaDDS, 59.0 mV/decade) and sodium dodecylbenzene sulfonate (NaDBS, 59.1 mV/decade) over the range of $3 \cdot 10^{-7}$ to $8 \cdot 10^{-3}$ M for NaDDS and $4 \cdot 10^{-7}$ to $2 \cdot 10^{-3}$ M for NaDBS. The detection limits for both NaDDS and NaDBS were $2 \cdot 10^{-7}$ M.

The sensitive, accurate, selective, rapid, simple and inexpensive *screen-printed* microsensor (SPMS) exhibited a sub-Nernstian response for sodium dodecyl sulfate (NaDDS, 50.2 mV/decade) and sodium dodecylbenzene sulfonate (NaDBS, 45.7 mV/decade) over the range of $2 \cdot 10^{-7}$ to $7 \cdot 10^{-3}$ M for NaDDS and $1 \cdot 10^{-7}$ to $2 \cdot 10^{-3}$ M for NaDBS. The detection limits for both NaDDS and NaDBS were $1 \cdot 10^{-7}$ M.

Different pH values, ionic strengths and commonly used nonionic surfactants, organic and inorganic anions did not have a significant influence on the sensors performances or the accuracy of ASs determination. The sensors were successfully applied to ASs determination in three commercial detergents with different percentages of ASs, as well as in several effluent samples containing different level of anionic surfactant concentration.

Keywords: surfactant sensor, anionic surfactant, potentiometric titration, *screen-printed* microsensor, PVC membrane, commercial products, effluents