Interaction of glucose oxidase with ionic surfactants: a microcalorimetric study

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Abstract
The enthalpies of interaction of glucose oxidase at 25°C with a homologous series of n-alkyltrimethylammonium bromides (TABs) at pH 10 and a homologous series of n-alkylsulfates at pH 3.2 have been measured by microcalorimetry. For the n-dodecyl member of each series, DTAB and sodium n-dodecylsulfate (SDS), the binding of the surfactants to glucose oxidase as measured by equilibrium dialysis has been used in combination with the enthalpy data to obtain the Gibbs energy ( ), enthalpy ( ) and entropy ( ) of binding per surfactant molecule as a function of the number of surfactant molecules bound ( ). The thermodynamic parameters for the glucose oxidase interaction with DTAB at pH 10 and SDS at pH 3.2 are very similar and show that the interactions are entropically driven. The observed enthalpies of interaction of glucose oxidase with the homologous n-alkylsulfates have been analysed in terms of the interactions between the anionic surfactant head group and cationic sites on the protein, hydrophobic binding and the thermal contributions arising from protein unfolding. At surfactant concentrations of 0.5 c.m.c., the enthalpy of unfolding of glucose oxidase is estimated to be 3610 ± 560 kJ mol−1.
Keywords: Glucose oxidase; n-alkyltrimethylammonium bromides; n-alkylsulphates; enthalpy; entropy; Gibbs energy

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