BINDING OF Na^+ AND K^+ TO THE HEADGROUP OF PALMITIC ACID MONOLAYERS STUDIED BY VIBRATIONAL SUM FREQUENCY GENERATION SPECTROSCOPY

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Alkali cations are critical in biological systems due to their electrical interaction with cell membranes. While Na^+ and K^+ share similar chemical and physical properties, they can exhibit differences when interacting with biological membranes. These phenomena may be modeled using a Langmuir monolayer of surfactant on alkali chloride solutions. Vibrational sum frequency generation (VSFG) spectroscopy is an interface specific technique that is widely employed to study molecular organization at surfaces and interfaces. VSFG spectroscopy was used to probe the CO_2^- vibrational mode for the carboxylic acid headgroup of palmitic acid (PA) spread on the surface of NaCl and KCl solutions in the vibrational region between 1400 and 1500 cm^{-1}. The ability of Na^+ and K^+ to bind with the carboxylic headgroup of PA is revealed by observing peak positions ($\sim$1410 cm^{-1} and $\sim$1470 cm^{-1}) and relative intensity for the CO_2^- peaks. These results are compared and discussed with perspective toward elucidating interfacial PA headgroup organization. The time evolution for the PA CO_2^- peaks is also monitored after monolayer spreading via VSFG and these results are presented as well.