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Design of Ion Sensors Based on Langmuir-Blodgett Films Having Potential-Sensitive Dyes

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In order to design an optical ion sensor based on Langmuir-Blodgett films containing potential-sensitive dyes, a novel technique of direct observation of surface monolayers with a fluorescence microscope was developed. The fluorescence image of the monolayer at the air-water interface was directly observed by a newly constructed fluorescence microscope attached to a Langmuir film balance. The fluorescence image and intensity of the didodecylphosphate monolayer containing a potential-sensitive dye (octadecylrhodamine B) and valinomycin were found to be strongly affected by phase transition of the monolayer. Fluorescence intensity was also found to be affected by the nonspecific interaction with additional ions in the water subphase as well as by the specific interaction of the valinomycin with potassium ions. The nonspecific effect on the fluorescence change was almost negligible when the valinomycin-containing monolayer was deposited on a quartz plate at low surface pressure below the phase transition. Fluorescence intensity of the LB film attached to a flow cell in a fluorescence spectrometer specifically decreased when potassium ions were introduced into the flow cell.