Solid-contact Potentiometric Sensor for the Determination of Total Ammonia Nitrogen in Seawater

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A solid-contact potentiometric sensor for in situ detection of total ammonia nitrogen (TAN, free ammonia plus the ammonium ion) in seawater is described. In the compact system, an all-solid-state polymeric membrane ammonium-selective electrode is integrated with a polyvinyl alcohol hydrogel buffer film of pH 7.0 and a gas-permeable membrane. The gaseous NH₃ in seawater diffuses through the gas-permeable membrane and is converted to NH₄⁺ in the hydrogel buffer, which can be potentiometrically sensed by the solid-contact ammonium-sensitive membrane electrode. The electrode configuration facilitates the alteration of NH₃ to NH₄⁺ in the hydrogel buffer film and improves the sensitivity for the detection of TAN by the buffer trap effect. The gas-permeable membrane effectively eliminates the ion interferences from the seawater sample matrixes. The proposed sensor shows a stable potentiometric response in the concentration range of 10⁻⁶ - 10⁻⁴ M with a detection limit of 6.4 × 10⁻⁷ M, and has been successfully applied to the detection of TAN in seawater.

Keywords: Ammonia, Hydrogel, Gas permeable membrane, Solid-contact ion-selective electrode, Seawater

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