The Difference in CO_2 Absorption Velocity between Sea and Fresh Waters

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Summary

The effects of sea water on the CO_2 transfer across the air-water interface were experimentally investigated in an oscillating-grid tank. The results show that the CO_2 transfer velocities across non-breaking air-water interfaces for $3.5wt\%$ salt, natural sea and artificial sea waters are damped to 50% of those for pure and tap waters. The reduction is caused not by surface contaminants characteristic of natural sea water but by the presence of very tiny surface-active impurities common to all the sea and fresh waters. The surface-active impurities reduce the molecular diffusivity of CO_2 at common interfaces to 7% of the molecular diffusivity at the really clean interface. The reduction amplifies the weak effect of electrolytes on the small difference of the molecular diffusivity between sea and fresh waters and it results in the large diffence of the CO_2 transfer velocity. Furthermore the ratio of the transfer velocity of sea water to that of fresh water increases from 0.50 to 0.97 as the interface is broken. Especially the differece between the transfer velocities becomes very small for intensively broken interface. This is attributed to that the effect of surface-active impurites on the mass transfer is weaken by the replacement of the interface by the fresh bulk-fluid.