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## The Formation of Gas Bubbles in Liquids

W. G. Eversole  
*State University of Iowa*

G. H. Wagner  
*State University of Iowa*

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## SOME CHEMICAL ASPECTS OF THE LIMNOLOGY OF THE LAKES IN THE OKOBOJI REGION

BEN H. PETERSON

The mineral content of several lakes, bogs, springs and ponds in the Lake Okoboji region show wide variation in quantity and ratio of dissolved salts. The dissolved Oxygen, alkalinity, conductance and pH of West Okoboji and East Okoboji have been measured at intervals during the summer months of 1937 and 1938. The thermocline develops slowly in West Okoboji, deep lake, and reaches full development late in July. This condition then remains for the remainder of the summer. Spirit Lake, East Okoboji, which are typical shallow lakes, develop thermoclines which are disturbed by strong winds. Occasionally hydrogen sulfide develops in the bays to such an extent that absorbed oxygen is completely removed from the water.

The mineral content of the cold spring bog water, shows similarities in bogs widely separated. Some of these bogs contain sulfur bearing springs.

The pH of a large number of pond waters was determined and compared with the algae growth present.

DEPARTMENT OF CHEMISTRY,  
COE COLLEGE,  
CEDAR RAPIDS, IOWA.

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## THE FORMATION OF GAS BUBBLES IN LIQUIDS

W. G. EVERSOLE AND G. H. WAGNER

Gas bubbles which were formed by passing nitrogen through a glass capillary into liquids were studied by means of stroboscopic frequency measurements, rate of gas flow, and instantaneous (approx.  $10^{-5}$  sec. exposure) photographs. The size of the bubbles was determined both from the frequency and rate of gas flow and from measurements of the photographic images of the bubbles.

The following pure liquids and solutions were used at room

temperature: ethyl alcohol, n-propyl alcohol, aniline, acetone, benzene, chloroform, carbon tetrachloride, methyl alcohol, n-butyl alcohol, ether, and three aqueous solutions of ethyl alcohol. The pressures used were varied from the lowest pressure which would give a steady stream of bubbles (approx. 0.6 cm. of Hg) up to about 2.3 cm. of Hg. Capillary diameters were from 0.0137 to 0.0341 cm.

The bubble frequency was practically constant (45-50 bubbles / sec.) for the pure liquids studied at all pressures and capillary diameters used. It follows therefore that the size of each bubble (cm<sup>3</sup>) is directly proportional to the rate of gas flow (cm<sup>3</sup>/sec.) and is independent of the properties of the liquid and the capillary diameter in the range of experimental conditions used. Higher pressures, larger capillary diameters, and lower surface tension give larger bubbles as a result of the increased rate of flow. In the case of 20.2, 70.0, and 40.7 per cent aqueous solutions of ethyl alcohol the bubble frequency was greater than with pure liquids and showed a much greater variation with pressure.

DEPARTMENT OF CHEMISTRY,  
STATE UNIVERSITY OF IOWA,  
IOWA CITY, IOWA.

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## THE TRANSITION TEMPERATURE OF DEUTERATES

O. W. MUELDER

The transition points of a number of salts,

Na <sub>2</sub> CrO <sub>4</sub> .10D <sub>2</sub> O.....	Na <sub>2</sub> CrO <sub>4</sub> .4D <sub>2</sub> O
Na <sub>2</sub> CrO <sub>4</sub> .10D <sub>2</sub> O.....	Na <sub>2</sub> CrO <sub>4</sub> .6D <sub>2</sub> O
MnCl <sub>2</sub> .4D <sub>2</sub> O.....	MnCl <sub>2</sub> .2D <sub>2</sub> O
Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> .5D <sub>2</sub> O.....	Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub>
Na <sub>2</sub> SeO <sub>4</sub> .10D <sub>2</sub> O.....	Na <sub>2</sub> SeO <sub>4</sub>

have been determined. The thermometric method for determining transition temperatures was used. An apparatus was used which required only a few ml. of the deuterium oxide yet accurate to within  $\pm .002^{\circ}\text{C}$ .

After comparing the transition points of deuterates with those of the corresponding hydrates, isomorphous crystals seemed to be similarly affected.

The fact that certain deuterates show a higher transition tem-