

to  $\text{ClO}_3$ , and not to the anhydride of chlorous acid,  $\text{Cl}_2\text{O}_3$ . For the latter, which has not been isolated, we suggest the name 'chlorous oxide'.

	Initial Pressure (mm.) (Chlorine Oxide) <i>a</i>	Final Pressure (mm.) (Chlorine + Oxygen) <i>b</i>	Ratio <i>bla</i>
1 <i>a</i>	2.81	5.42	1.93
1 <i>b</i>	3.52	6.93	1.97
2 <i>a</i>	1.37	2.70	1.98
2 <i>b</i>	2.98	5.74	1.98

There is little evidence to indicate the molecular weight of the pure liquid. Measurements of its vapour pressure lead to an abnormally low value for the latent heat of vaporisation for such a non-volatile substance. This may be due to an exothermic dissociation taking place on evaporation. Furthermore, there is a marked difference between the absorption spectra of the liquid and the vapour in similar molecular thicknesses. Until more definite evidence is advanced, it can be assumed that chlorine trioxide is associated in the pure liquid phase and probably exists as  $\text{Cl}_2\text{O}_6$ .

C. F. GOODEVE.  
F. A. TODD.

Sir William Ramsay Laboratories of  
Inorganic and Physical Chemistry,  
University College, London.  
Aug. 23.

- <sup>1</sup> Bowen, *J.C.S.*, 123, 2328; 1923. Bowen and Booth, *J.C.S.*, 127, 510; 1925.  
<sup>2</sup> Bodenstein, Harteck and Padelt, *Z. anorg. Chem.*, 147, 233; 1925.  
<sup>3</sup> Hinshelwood and Hughes, *J.C.S.*, 125, 1841; 1924.  
<sup>4</sup> Bodenstein and Schumacher, *Z. physik. Chem.*, B 5, 209; 1929.  
<sup>5</sup> Schumacher and Stieger, *Z. physik. Chem.*, B 7, 363; 1930.  
<sup>6</sup> Beaver and Stieger, *Z. physik. Chem.*, B 12, 93; 1931.  
<sup>7</sup> Finkelnburg, Schumacher and Stieger, *Z. physik. Chem.*, B 15, 127; 1931.  
<sup>8</sup> Finkelnburg and Schumacher, *Z. physik. Chem.*, Bodensteinfestband, 704; 1931.  
<sup>9</sup> Allmand and Spinks, *J.C.S.*, 1652; 1931; and 599; 1932.  
<sup>10</sup> Spinks, *J.A.C.S.*, 54, 1689; 1932.  
<sup>11</sup> Heidt, Kistiakowsky and Forbes, *J.A.C.S.*, 55, 223; 1933.  
<sup>12</sup> Norrish and Neville, *NATURE*, 131, 544, April 15, 1933.  
<sup>13</sup> Schumacher and Stieger, *Z. anorg. Chem.*, 184-185, 272; 1929.

### Bound Water of Gelatin Gels

A FEW years ago, one of us (T.M.<sup>1,2</sup>) showed that by freezing, water could be withdrawn from a gelatin gel, the concentration of the remaining gel at equilibrium with any temperature increasing with falling temperature down to a temperature of  $-20^\circ$ , below which no further water could be drawn out of the gel. At this temperature, the concentration of the gelatin in the gel is 66 per cent. The water in this gel was described as the combined (or bound) water and the experiments showed, therefore, that 1 gm. of gelatin combines with or binds about 0.5 gm. of water with forces greater than those of the formation of ice crystals at  $-20^\circ$ .

A more direct measure of the force binding water to gelatin has now been obtained. With the use of an ultra-filter made of stout canvas impregnated with collodion, water can be squeezed out of gelatin gels in a press. A range of pressures from 0 to 2,250 lb. per square inch was used in the experiments and it was found that the concentration of the gel in equilibrium at the different pressures increased with increasing pressure up to a pressure of about 2,000 lb. At this pressure the concentration of gelatin in the

gel is 60 per cent, a figure fairly close to that obtained at  $-20^\circ$  in the freezing experiments.

The experiments, therefore, confirm the view put forward previously that the water in gelatin gels exists in at least two states, firmly 'bound' or 'combined' water (which can also be called water of hydration) and loosely bound or 'free' water and, moreover, supports the quantitative relation previously obtained that 1 gm. of gelatin binds or combines with approximately 0.5 gm. of water.

The experiments referred to were carried out both at room temperature ( $18^\circ$ - $22^\circ$ ) and at  $0^\circ$ ; the same pressure-concentration curve was obtained at both temperatures. Further work on the influence of temperature, hydrogen ion concentration, salt content, etc., on the bound water is in hand; the method is also being extended to higher pressures.

D. JORDAN LLOYD.

Laboratories of the British Leather  
Manufacturers' Research Association.

T. MORAN.

Low Temperature Research Station,  
Cambridge.

<sup>1</sup> Moran, *Proc. Roy. Soc.*, A, 112, 30; 1926.

<sup>2</sup> Moran, *Proc. Roy. Soc.*, A, 135, 411; 1932.

### Interaction between Soot Films and Oil

THE gas bubbles evolved on impacting the drop<sup>1</sup> are not likely to originate in the carbon film, which is so thin that even gas inter-layering implies adsorption, which Mr. Carding's experiment<sup>2</sup> with ammonia seems to show non-existent.

The production of the 'effect' suggests the plasticity and permeability of the film. In the time-fraction required for the drop to fall 3 cm., the inferior column of air of cross section equalling the drop diameter is likely to be compressed due to a slight time lag required for the drop pressure to become laterally equalised and nullified. The lower layers of the compressed air column will be driven between the particles of the carbon film (probably more readily than between lateral air molecules) to await expulsion as bubbles by the impacting drop; and/or, air may be trapped on impact between drop and film, then, passing under the film, burst through causing the clear spaces observed. Furthermore, the drop itself may carry an adsorbed gas layer, or due to its movement, even a shallow atmosphere, or owing to its fall its outer layer may become a colloidal dispersion of minute air bubbles in oil. In any of these cases such gas would probably be evolved as bubbles on impact.

The likelihood that the gas is, therefore, introduced as a foreign body due solely to the drop being impacted—since it is not present when the drop is posed—invalidates the impact method as presenting *not* an interaction between soot films and oil, but an interaction between soot films, *gas* and oil. The gas introduced is, on this basis, an agent of the impact in destroying the delicate central ring system produced when the interaction between soot film and oil alone is promoted.

Moreover, since the resulting respective figures are almost mutually exclusive they have not, in principle, separate simultaneous existence. Either result, therefore, is due to a manipulation variation in the cause of the other. A constructive interaction