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# THE EFFECT OF PRESSURES UP TO 17,000 ATMOSPHERES UPON SOME COLLOIDAL SUSPENSIONS

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In some work which was being conducted at Wesleyan during the past year, on the effect of pressures upon some living organisms, it was noticed that when the water containing these organisms was subjected to pressures of more than a few hunded atmospheres a turbidity was usually developed. This suggested that something in the solution was being precipitated by means of pressure. Upon inspection it was found that this was some of the colloidal constituents in the water, and it was desired to determine whether or not pressure alone would cause the precipitation of a pure colloidal suspension. A number of colloidal suspensions were chosen at random and subjected to pressures varying from a few atmospheres to 17,000 atmospheres.

For pressures up to 4,000 atmospheres, the suspensions were usually placed in a glass container, about seven millimeters in diameter and from four to eight centimeters in length, sealed at one end and having a close fitting movable rubber stopper in the other end to allow for compression as the pressure was applied. This glass container was then placed in the high pressure cylinder and surrounded by a light oil and the pressure applied. This method however was unsatisfactory for pressures above 4,000 atmospheres, due to the breakage of the glass containers.

For pressures above 4,000 atmospheres, the colloidal suspensions subjected to pressure were placed in a piece of rubber tubing, stoppered at both ends with rubber stoppers. These containers were then placed in the high pressure cylinder and surrounded by a light oil and the pressure applied. Various colloidal suspensions after being subjected to pressure, were immediately transferred to a glass specimen tube and allowed to stand. In each case where precipitation took place, it was very noticeable and settled out in a very short time.

The colloidal suspensions that were used in this investigation, were prepared according to the procedure given in Henry N. Holmes, "Laboratory Manual of Colloid Chemistry." The following colloidal suspensions were used: Ferric hydroxide, sulphur, silver, Prussian blue, gold, and molybdenum.

Colloidal ferric hydroxide was found to be precipitated immediately, when subjected to pressures of 300 atmospheres or above. When subjected to pressures of much less than 300 atmospheres precipitation was a little slower and pressures of as low as 100 atmospheres, were found to precipitate colloidal ferric hydroxide completely within an half hour or so.

Colloidal sulphur is precipitated very little by pressures of less than 9,000 atmospheres. But the precipitation is rather rapid and complete, when pressures of as high as 17,000 atmospheres are used.

Colloidal silver is precipitated very slightly by pressures much below 9,000 atmospheres. But it is completely precipitated within a few minutes by pressures of 17,000 atmospheres.

Prussian blue requires a pressure of approximately 2,000 atmospheres or above for immediate and complete precipitation.

Red colloidal gold prepared by the Tannin method, is readily precipitated by pressures above 2,000 atmospheres.

Of the colloidal suspensions studied molybdenum blue was the only one not completely precipitated by pressures above 9,000 atmospheres, if the colloid is allowed to remain under pressure from several minutes to a half hour. Molybdenumblue showed some color change not noticed in any of the other suspensions studied. Samples subjected to pressures of 2,000 to 9,000 atmospheres changed from blue to green and showed very little precipitation. However at pressures above 9,000 atmospheres the suspension retained its original color and was slightly precipitated.

In the above investigation it will be noticed, that molybdenum blue was the only one remaining in the suspended state after the pressure had been above that necessary for the formation of Ice Six, which is between 8,000 and 9,000 atmospheres.

No attempt has been made to make a very extensive study of the phenomena. However, this may prove an interesting field for further investigation and may throw some light on Colloidal behavior.

| Colloid | 2,000 to 4,000 | 4,000 to 9,000 | 9,000 to 17,000 |
|---|---|---|---|
| Ferric hydroxide | Complete | Complete | Complete |
| Sulphur | No effect | Slight | Complete |
| Silver | No effect | No effect | Complete |
| Prussian blue | Complete | Complete | Complete |
| Gold | Complete | Complete | Complete |
| Molybdenum blue | None, slightly green | Slight precip. turned green | Slight precip., no change in color |

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