

Why do Icebergs float?

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Abstract: The idea of this paper is why and how icebergs float in the ocean? The formation of the iceberg and its behavior towards the water is explained. Paper also explains the physical and chemical aspects behind the iceberg flotation.

Keywords—*Icebergs; Ocean; Water; Density; Flotation*

I. INTRODUCTION

In nature, water is present in different states as **Solid, Liquid, and Vapour** and has a different density. When a huge chunk of an ice shelf or a glacier breaks off and enters into the ocean that forms a massive Iceberg. It is also noted that the glacier and ice shelves are formed with snow, which is frozen freshwater. So the icebergs formed with freshwater [1].

Flotation does not depend on the mass of the body, rather the relative density of the substance in which it is submerged. Water density is not constant at all temperatures. It is obvious that the density of water keeps increasing with a decrease in temperature, which to till a certain temperature of 4 degrees centigrade. After that its density starts decreasing and it expands into solid-state, this phenomenon is called **anomalous behaviors of water**. Hence the density of ice is measured less than the density of water [2].

II. PHYSICAL ASPECTS

Archimedes' Principle states that the liquid exerts buoyant force in an upward direction on a body immersed in a fluid is equal to the weight of the fluid that displaced by the body. This helps a body to float in water. This is the reason; icebergs do not sink in water.

Fig. 1 states, Buoyance force, $F = \text{Weight of the fluid displaced, } W$

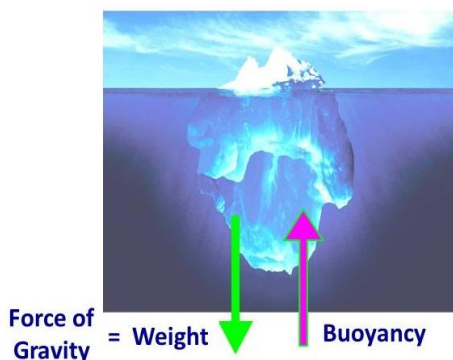


Figure 1: Iceberg View and force on it.

Also the Icebergs float in the ocean with 90 percent of its part into the water, only 10 percent one can see from outside. There are also different shapes and sizes of icebergs which enhance the flotation in the ocean.

Table I: Density of different states of water.

Density of water at different temperature		
Ocean water(0 deg)	Fresh water(20 deg)	Ice(-20 deg)
1.03gm/cc	1gm/cc	0.92gm/cc

Table I represents the density of water (gram per cubic centimeter) at different temperature (degree centigrade). Ocean water is denser than fresh water, because of the temperature and salt present in it. And the iceberg formed with the freshwater contains no impurity is less dense. This is the reason that icebergs float in the ocean [3].

III. CHEMICAL BONDING OF WATER AND ICE

Iceberg is nothing but the crystalline structure of the water molecules. And any crystalline structures are lighter compared to the normal structure of the same molecules.

In fig (2) if we look to the structure of the hexagonal molecule of the Iceberg, the air that is filled between empty spaces increases the volume and decreases the density of Ice Cube. So ultimately its density is less than the density of water [4].

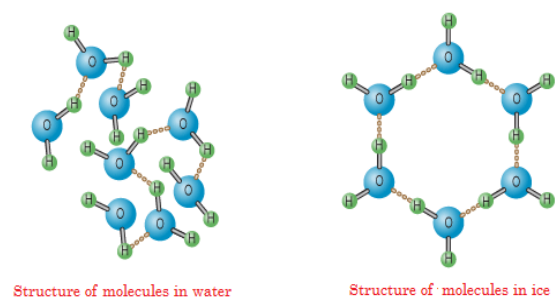


Figure 2: Chemical structure of water and ice.

IV. CONCLUSION

A floating iceberg must satisfy the Archimedes' principle. Moreover, with the lowering of water temperature below 4 degrees centigrade, the density starts decreasing. The objects which are denser than water will sink and the objects which are less dense compared to water will float.

V. REFERENCES

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