

## **WATER - A COMMON SUBSTANCE WITH UNCOMMON PROPERTIES**

**B. Makkawi, G. P. Rao, A. Woldai and D. Al-Gobaisi**

*International Center for Water and Energy Systems, Abu Dhabi, UAE*

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### **Contents**

1. What is Water?
  2. Origin of Water and the Oceans on the Earth
  3. Properties of Water
  4. Molecular Structure of Water
  5. Hydrogen Bond
- Bibliography and Suggestions for further study

### **1. What is Water?**

- Water is the essence of life. It is the major component of the living substance (protoplasm) of which animal and plant bodies are made. It is essential for the making of starch by plants in photosynthesis. It reacts with various substances to form hydrates. In these, the water molecule is intact but becomes a part of the structure of the solid.
- Water is an odorless, tasteless, transparent liquid at room temperature.
- Chemically, water is a compound of hydrogen (11.1 per cent by weight) and oxygen (89.9 per cent by weight).
- Water is the best known of solvents.
- Water is not a strong oxidizing agent; it is an even poorer reducing agent.

### **2. Origin of Water and the Oceans on the Earth**

It is now generally accepted that the elements that comprise water, namely, hydrogen and oxygen were formed in the "big bang" and in the interior of stars by a process of nuclear synthesis. The formation of the Earth probably took a few hundred million years to be completed, and it developed a solid crust about 3.5 billion years ago. As it stabilized, the Earth went through a process of releasing gases from its interior. Over about 100 million years, this degassing of the earth gave rise to the atmosphere. The oceans were formed by the condensation of steam as the temperature of the Earth dropped, in its early history.

The Earth's water content seems to make the planet unique in the solar system. That water seems to have existed in a form not too different from its present state, for billions of years. It is estimated that only about 0.2 per cent of the water in the oceans is lost annually into outer space. Most of the lost water is replaced by the same geological processes that originally created the oceans. About 70 per cent of the surface of our

planet is under water. We are privileged in having had such a large amount of this unique substance on the surface of our planet for so long a time. Despite an increase of nearly 20 per cent in the sun's luminosity, the oceans have not boiled away. The evolution of algae and other forms of life created a wonderful balance of heat and matter. There is cooling due to these effects, but not enough to freeze the planet; just enough to keep most of the water in the liquid state.

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#### **Bibliography and Suggestions for further study**

Van der Leeden F, Troise FL, and Todd DK (eds) 1990 *The Water Encyclopedia*. Michigan, USA: Lewis Publishers. [Chapter 11, Section A of this book tabulates the physical properties of water in considerable detail.]