

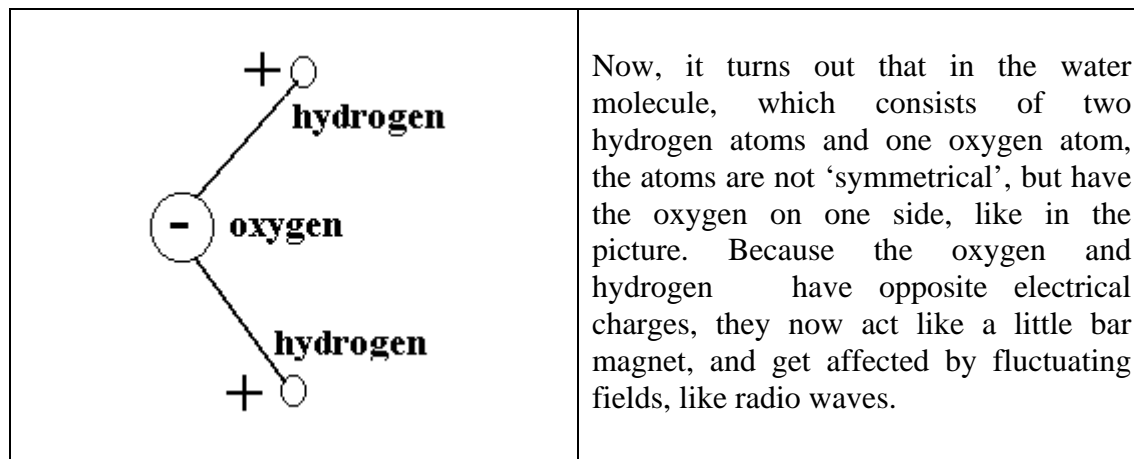
The Micro Oven and the Cell Phone

During World War I, England tried hard to develop a machine to focus electromagnetic waves (radio waves) as a kind of 'death ray', for military use, says S.Ananthanarayanan.

They did not get far, but the research did lead to radar, and later, microwave communications and the microwave oven.

Microwaves and the water molecule

Normal radio waves have wavelengths of the order of hundreds of metres. For TV or FM radio, the wavelength is less than a metre, and is more 'directional'. Wavelengths in centimetres and below are in the 'microwave' region. As short wavelength means high frequency, microwaves have hundreds of billions of cycles a second.



Normal radio waves are too slow to affect them in a major way, but microwaves are near the natural rotational frequency of water molecules and they set them spinning at tremendous speeds. This is what happens with the molecules of water in the liquid state, where the molecules are 'free' to move.

The Microwave oven

This is the principle of the microwave oven, which is effective with anything that has water content. As it is a case of high frequency waves, any metal in the oven will develop high voltages and begin to spark and may catch fire. This is why metal containers, even metal designs on glass containers are forbidden in microwave ovens. The microwave oven has no effect on ice, as the water molecules in ice are not free, but are 'bound', as ice is a solid. This is the reason that we should not place frozen food in the microwave oven, but should allow the food to thaw a little first. As soon as a little liquid water forms, the food can be warmed fast in the micro oven.

The Cell Phone

The other great use of microwaves has been in communications. Because of the high frequency, a large number of 'channels', or separate streams, of communication can be pinned on to a microwave beam of one frequency, called a 'carrier'. This has found application in recent times in the lightweight, short range, mobile telephones used as 'cell' phones. In 'cell' telephony, a city is divided into a large number of 'cells', and one set of frequencies is assigned to a cell. As the signals have short range, the same frequencies can be used again in a cell at a distance. This allows the same frequency to be 'reused' and is the secret of the cell phone revolution.

Danger of Cell phones

A problem with cell phones is that they continuously emit signals in the microwave region. Although not strong enough to boil and cook, these certainly have some effect on the person using the phone, particularly when talking with the instrument placed next to the head. There is no evidence that some damage has been caused, but this may not be true after cell phones have been used for many years. A smart thing may be to use cell phones only for short messages or enquires and not for extended conversations.
