UV ABSORPTION SPECTRA OF MOLECULES AND THE CONNECTION WITH PUMPING MECHANISMS FOR ASTROPHYSICAL MASERS

J.C. Viney
King's College, Cambridge, England

Since interstellar masers were first discovered in 1965, various attempts have been made to account for the variety of behaviour observed. In particular a number of theoretical models have been advanced to account for the pumping mechanisms but none have gained a wide acceptance.

Over forty molecules have now been identified in the interstellar medium, of these five exhibit maser action; they are detected by virtue of their small angular diameter and very large brightness temperatures $> 10^{13}\ ^{o}K$. The molecules in question are H_2O, OH, SiO, CH_3OH and CH, of these the Hydroxyl maser presents the widest range of behaviour and therefore if the physical mechanisms involved could be understood these masers could be used to probe the interstellar environment and obtain more information about this important region where new stars are formed.

The region where masers act have been identified with the circumference of Infra Red and Ultra Violet stars. In these regions there is a large abundance of atomic and molecular hydrogen; both these forms of hydrogen have transitions below 1200Å. One or more of these hydrogen transitions could act as a pump for the masers listed above, if these molecules have absorption features overlapping the line width of the atomic or molecular hydrogen. Depending on how this is coupled to the rotational levels in the ground state of these molecules, a population inversion could occur, hence giving maser action.

Oka and Johns, 1971 have shown that there exists a possible ultra violet mechanism in H_2O, but there has not existed the spectroscopic data on the other molecules below 1200Å. Therefore, work has been carried out in Bonn using the Synchrotron facility of the Physikalisches Instutit in the University of Bonn, to observe the absorption spectra of OH, SiO and CH_3OH, in the range 1300-500Å. Some conclusions and interpretations of this ongoing work will be presented and possible pumping mechanisms indicated.

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