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Using a Microwave Resonant Cavity to Study Hydrogen Bonding at Phase Transition in H_2O and D_2O JAMES ROBERTS, University of North Texas, JAI DAHIYA — The resonant microwave cavity is a very sensitive device for detecting small changes in material properties as they are perturbed by temperature, electric and magnetic fields. In this laboratory all states of mater have studied with the resonant cavity, including the plasma state. In this paper we report on an experiment with water as it changes from liquid (disordered) to water ice (ordered) phase. In that hydrogen bonds are involved n this process, we are able to observe behavior in the dielectric response of H_2O as it is cycled from solid to liquid. The transition through the densest state of water near 4°C indicates that the order of the water molecules in the ice phase is less than that experienced at the most dense temperature of water. If we associate this density with the interaction of the hydrogen bonds, it can be postulated that the distribution of the structure in snowflakes is a consequence of random processes in sharing the hydrogen bonds as the system cycles from the disordered state to the more ordered state. Phase transition from liquid to solid and solid to liquid was studied for H_2O and D_2O. It is expected that the bonding of the two molecules will behave the same during the transition from ordered to disordered states and in the reverse transition. The apparatus used in this investigation will be discussed.

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