MID-IR SATURATION SPECTROSCOPY OF HeH^+ MOLECULAR ION

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The HeH^+ ion, one of the simplest diatomic molecular ions, plays an important role not only in the quantum mechanical calculations but also, potentially, in the astrophysics. In this report, we demonstrated the first observation of the saturation absorption spectrum of the HeH^+ using a continuous-wave, singly resonant, single frequency and widely tunable optical parametric oscillator in the mid-infrared region. The HeH^+ ions were produced in an ethanol cooled extended negative glow discharge tube at -70 degrees centigrade with flowing mixtures of helium and hydrogen. The negative glow region of discharge was extended by applying an axial magnetic field of 300 gauss. The saturation spectrum of HeH^+ (R(1) transition of ν=1-0 band at 90,788 GHz) was observed by scanning the frequency of the pump laser and demodulated at third harmonics by a lock-in amplifier. The investigations of the linewidth and the frequency measurement will be also presented.