ABSORPTION LINE SURVEY OF H_3^+ TOWARD THE GALACTIC CENTER

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We present high-resolution (R = 20000) spectroscopy of H_3^+ absorption toward the luminous Galactic center sources GCS 3-2 and GC IRS 3. With the efficient wavelength coverage afforded by a new generation spectrograph available at the 8-m class telescope, six absorption lines of H_3^+ have been detected in each source, three of which are new. In particular the 3.543 μm absorption line of the $R(3, 3)^l$ transition arising from the metastable (J, K) = (3, 3) state has been tentatively detected for the first time in the interstellar medium. The H_3^+ absorption toward the Galactic center takes place in dense and diffuse clouds along the line of sight as well as the molecular complex close to the Galactic nucleus. At least four kinematic components are found in the H_3^+ absorption lines. We suggest identifications of the velocity components with those of H I, CO, and H_2CO previously reported from radio and infrared observations. Our observation has revealed a striking difference between the absorption profiles of H_3^+ and CO, demonstrating that the spectroscopy of H_3^+ provides information complementary to that obtained from CO spectroscopy.