

MOLECULAR HYDROGEN AT $Z = 2.8108$

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The Lyman and Werner bands of H_2 in interstellar gas provide information about gas temperature, density and the ultraviolet radiation field, and possibly about dust content. This is especially useful for high redshift QSO absorption systems, where usually the only data available arise from absorption lines. We present 25 – 50 km s⁻¹ resolution data taken with the CTIO 4m telescope plus echelle spectrograph of the Ly α forest region of 0528–250, which has a damped Ly α absorption system at $z = 2.81$. Using a χ^2 profile fitting routine (Lanzetta & Bowen 1992, ApJ, 391, 48), we find an H_2 fraction of $\sim 10^{-2}$, an order of magnitude below that of Galactic diffuse interstellar clouds. This may be caused by some combination of a less efficient H_2 formation rate or an increased H_2 dissociation rate. Using the relative populations of the $J'' = 0, 1$ rotational levels, we derive a kinetic temperature of $T_K = 136 \pm 16$ K. The total velocity spread as traced by sensitive metal transitions is 250 km s⁻¹, consistent with a highly inclined, rotating ensemble of clouds associated with a luminous spiral galaxy. A representative section of the spectrum is shown below, binned at roughly the Nyquist rate with the χ^2 fit to H_2 of the $z = 2.8108$ absorption system.

