Shock Temperatures of the R Impact Flare of Comet Shoemaker-Levy 9

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We obtained 11 near-IR spectra of the flare caused by the R impact of Comet Shoemaker-Levy 9 at Steward Observatory during a ten minute period from 1994, July 21, 05:40 (UT), when the major R brightening started, to 05:50 (UT) when the major R brightening nearly ended. The spectral range was 2.28 - 2.36 microns with a spectral resolving power of approximately 3600. If our spectra are integrated to obtain a photometric light curve, they agree closely with that of Graham *et al.* (1995), who observed with a filter covering nearly the same spectral interval. To analyze the spectral behavior, we constructed synthetic spectra including the 2-0 and 3-1 bands of carbon monoxide, combination bands of methane, and a thermal continuum. Since the impact site was still in shadow, we did not include a solar reflection continuum. We found satisfactory fits between the synthetic spectra and the observations under the following conditions: 1.) methane emission was confirmed, but at a level that implies significant depletion relative to the normal CO/CH4 in the Jovian atmosphere; and 2.) the maximum rotational temperature of the CO was approximately 1500 K at the beginning of the flare and approximately 5000 K at the end. This latter result is inconsistent with a cooling model that could otherwise fit the photometric light curve. The high CO temperature at the end of the event is consistent with a strong-shock model in which high-speed infalling cometary COs produce shocks.