THE TIME EVOLUTION OF SHOCK CHEMISTRY. REVEALING THE MOLECULES EJECTED FROM GRAINS.

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ABSTRACT

We present the mapping of relatively narrow emission ($\sim$1 km s^{-1}) from shock molecular tracers like SiO, SO, CH_3OH, and H_2S toward the young outflow L1448–mm. From the line profiles and derived abundances, we distinguish between three different evolutionary stages in the gas: the preshock component centered at 4.7 km s^{-1}, the shock–precursor cloud at 5.2 km s^{-1}, and the postshock gas, whose emission has a terminal velocity of $\sim$10 km s^{-1}. As expected from the quiescent cloud, the CH_3OH, SO and H_2S abundances does not show any correlation with the SiO abundance in the preshock gas. In the shock–precursor cloud, the enhancement of the SO, CH_3OH and H_2S abundances by up to a factor of 10 as the SiO abundance increases, indicates the presence of a special chemistry generated by the interaction of the shock precursors with the ambient material. The broader CH_3OH, SO and SiO wings observed toward the L1448–mm (0,–20) position, and the postshock abundances enhanced by a factor of $\sim$1000, suggest that these molecules are likely the precursors of the shock chemistry during the first stages of the shock evolution.