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SMA Observations of Organic Molecules in IRAS 16293-2422 Hot Corinos

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Abstract. The solar-type protostellar source IRAS 16293-2422 (hereafter I16293) is a protobinary system with its two components separated by $5''.2$ ($\sim$840 AU). Single-dish observations suggested that I16293 contained a hot molecular core about 150 AU in size with a rich molecular inventory similar to the hot molecular cores found in massive star-forming regions. However, all the hot core interpretations were derived from single-dish observations which suffered from insufficient angular resolution. One major concern was that its inferred size of $\sim$150 AU ($\leqslant 1''$) is much smaller than the binary separation in I16293, and comparable to the dimensions of protostellar disks. The precise nature of the I16293 hot core thus could not be determined. By conducting arcsecond-resolution Submillimeter Array (SMA) observations at 344/354 GHz, with the rich organic inventory revealed including complex organic molecules CH_3OH, CH_2CHCN, $HCOOCH_3$, $(CH_3)_2O$, C_2H_5OH and C_2H_5CN, we first uncovered the existence of two, rather than one, compact hot molecular cores ($\leqslant$ 400 AU in radius, now referred as *hot corinos*) associated with each of the protobinary components identified by their thermal dust emission in the inner star-forming core. In our recent 690-GHz SMA observations, more molecular lines of large organics were detected, some with fairly high energy levels, toward the I16293 hot corinos. The existence of a rich organic chemistry in solar-type hot corinos strengthens the link between molecular cloud chemistry, the starting materials of protoplanetary disks such as the protosolar nebula, and the composition of comets. Our findings concerning large organics in I16293 are thus important to the study of chemical evolution of hot corinos.