

Chemistry as a Diagnostic of Star Formation
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Chemical Structure of A Preprotostellar core: B68

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Recent extinction data show that dark cloud core B68 is remarkably consistent with density profile of a Bonner-Ebert sphere. B68 has been suggested to be a preprotostellar core on the verge of collapse. Therefore it is important to characterize its chemical and physical properties. In this paper we present spectral line observations of NH₃ (1,1) and (2,2), CCS, and C₃H₂ obtained with NASA's Deep Space Network telescopes at Goldstone. The NH₃ emission is centrally peaked while CCS and C₃H₂ emissions show a minimum near the center, suggesting these molecules are depleted at the core center. We use the kinetic temperature derived from NH₃ (1,1) and (2,2) lines to constrain the models for the core density structure. Density and time dependent chemical models predict such depletion in dense cores. Similar chemical differentiation has been observed in prototypical preprotostellar core L1498. We discuss the evolutionary status of these cores. This research was conducted at the Jet Propulsion Laboratory, California Institute of Technology with support from the National Aeronautics and Space Administration. This work was performed while S.L. held a National Research Council-JPL Research Associateship.