

DETECTION OF THE CCP RADICAL ($X^2\Pi_r$) IN IRC+10216: A NEW INTERSTELLAR PHOSPHORUS-CONTAINING SPECIES

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The CCP radical ($X^2\Pi_r$) has been detected in the circumstellar gas of IRC+10216, the fifth phosphorus-bearing molecule identified in interstellar space. Four rotational transitions of this species were observed using the Arizona Radio Observatory (ARO) 12m telescope on Kitt Peak at 2 and 3 mm. Each transition consists of lambda-doublets, which are well-separated in frequency in IRC+10216; five of these eight possible lines of CCP were clearly detected, while the remaining three were contaminated by stronger emission from other species. The column density derived for CCP was $N_{tot} = 1 \times 10^{12} \text{ cm}^{-2}$ and $T_{rot} = 21 \text{ K}$. Modeling of the line profiles suggests that CCP arises from an extended shell with a maximum radius of 40". The abundance of this radical, relative to H_2 , is $f = 1 \times 10^{-9}$ - roughly comparable to that of PN and CP in this source. CCP may be produced from radical-radical reactions of CP, or ion-molecule chemistry involving P^+ and HCCH. The identification of CCP is additional evidence that phosphorus chemistry is active in carbon-rich circumstellar gas.