

REACTIONS OF GROUND STATE NITROGEN ATOMS $N(^4S)$ WITH ASTROCHEMICALLY-RELEVANT MOLECULES ON INTERSTELLAR DUSTS

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In the last few years, ambitious programs were launched to probe the interstellar medium always more accurately. One of the major challenges of these missions remains the detection of prebiotic compounds and the understanding of reaction pathways leading to their formation. These complex heterogeneous reactions mainly occur on icy dust grains, and their studies require the coupling of laboratory experiments mimicking the extreme conditions of extreme cold and dilute media. For that purpose, we have developed an original experimental approach that combine the study of heterogeneous reactions (by exposing neutral molecules adsorbed on ice to non-energetic radicals H, OH, N...) and a neon matrix isolation study at very low temperatures, which is of paramount importance to isolate and characterize highly reactive reaction intermediates. Such experimental approach has already provided answers to many questions raised about some astrochemically-relevant reactions occurring in the ground state on the surface of dust grain ices in dense molecular clouds. The aim of this new present work is to show the implication of ground state atomic nitrogen on hydrogen atom abstraction reactions from some astrochemically-relevant species, at very low temperatures (3K-20K), without providing any external energy. Under cryogenic temperatures and with high barrier heights, such reactions involving $N(^4S)$ nitrogen atoms should not occur spontaneously and require an initiating energy. However, the detection of some radicals species as byproducts, in our solid samples left in the dark for hours at 10K, proves that hydrogen abstraction reactions involving ground state $N(^4S)$ nitrogen atoms may occur in solid phase at cryogenic temperatures. Our results show the efficiency of radical species formation stemming from non-energetic N-atoms and astrochemically-relevant molecules. We will then discuss how such reactions, involving nitrogen atoms in their ground states, might be the first key step towards complex organic molecules production in the interstellar medium.