H-Atom-Abstraction and H-Atom-Addition Reactions of Fulminic Acid (HCNO) and Formaldoxime (H_2CNOH) in Solid *para*-H_2

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Until the end of 2021 more than 260 molecules were identified in the interstellar medium (ISM). The most abundant of them in the ISM is H_2. One of the central questions of astrochemistry is how H_2 is formed in dense molecular clouds. According to recent theoretical studies, it is possible that H_2 is generated in catalytic cycles.[1] In the catalytic cycles two H atoms recombine to an H_2 molecule with the help of a catalyst.

The aim of our research work was to investigate the catalytic cycle of fulminic acid (HCNO) and formaldoxime (H_2CNOH). The molecules were trapped in *para*-H_2 matrix at 3.1 K. Then, H atoms were generated in the matrix. In *para*-H_2, the H atoms can diffuse efficiently, which enabled the examination of the reactions of the trapped molecules with H atoms. The chemical changes were followed by IR spectroscopy.

According to our experimental results, fulminic acid and formaldoxime can react with H atoms in *para*-H_2 matrix at 3.1 K. This observation indicates that the same reactions might also occur in the dense molecular clouds and these reactions can catalyze the H_2 formation. While fulminic acid is present in a large amount in the ISM, formaldoxime has not been detected yet. The experimental results have shown that the quantity of fulminic acid and formaldoxime is connected to each other through a quasi-equilibrium reaction. This quasi-equilibrium is shifted towards the fulminic acid, which may explain the non-detection of formaldoxime in the ISM.

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[1] Vidali, G. H_2 Formation on Interstellar Grains *Chemical Reviews* **2013**, *12*, 8762.