

Spectroscopic Characterization of Interstellar Relevant Imine Species

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Simple imines are frequently used as building blocks in the synthesis of more complex molecules. In solution imines are typically prepared from carbonyl compounds and ammonia or primary amines, respectively. The simplest aldimine, formaldimine (H_2CNH), has been discovered in space but cannot be isolated on Earth due to polymerization or oligomerization when concentrated. Aldimine building blocks play a key role in the formation of biorelevant molecules like amino acids or nucleobases in prebiotic chemistry. However, spectroscopic data of the compound class are rare or missing at all due to their high reactivity and the absence of molecular precursors for an on-demand mild generation. The overall goal of this project is to learn more about interstellar and prebiotic imine chemistry and characterize often proposed but yet elusive imine species.

1,2-Diiminoethane was photochemically prepared from explosive 1,2-diazidoethane in solid argon at 3 K and characterized by infrared and UV/Vis spectroscopy. In aqueous solution the simplest diimine serves as a fundamental building block for imidazole heterocycles.

The simplest α -imino acid, namely glycine imine, was prepared by UV irradiation of azidoacetic acid in solid argon at 3 K and characterized by IR and UV/Vis spectroscopy. In aqueous solution at higher concentrations glycine imine undergoes self-reduction to glycine by oxidative decarboxylation chemistry. The imine serves a critical intermediate in prebiotic amino acid synthesis.

2-Iminoacetaldehyde was proposed as an interstellar molecule and prepared by photolysis of 2-azidoacetaldehyde in solid argon at 3 K and low-density amorphous water ice. The imine was characterized by infrared and UV/Vis spectroscopy.

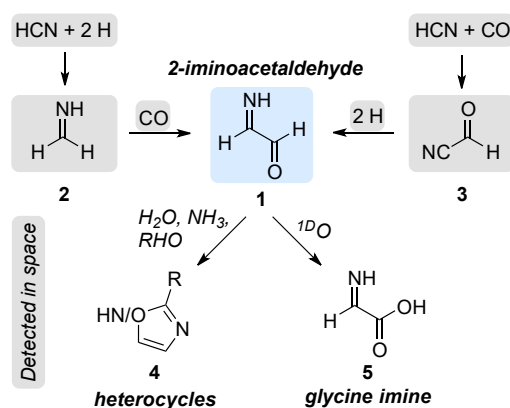


Figure 1: Characterization of 2-iminoacetaldehyde as a potential building block for heterocycles and amino acids.

References

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