From Interstellar Ices to Polycyclic Aromatic Hydrocarbons
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Toward peptide bond formation in ice analogs

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The peptide bond is a fundamental building block of life on earth as we know it [1]. Dipeptides are important carriers of the peptide bond and are not only building blocks of proteins but may have played an important role in prebiotic evolution. As catalyzers they can support the formation of sugars, longer peptides or even enzymes [1-3]. Here we report on experiments aimed to understand the complex chemistry of interstellar ices under the influence of ionizing radiation. In detail, we report results on electron irradiated NH 3 /CO ice. [4]

We utilize a reflectron time of flight mass spectrometer (ReTOF) coupled with soft VUV photoionization to detect molecules after they sublime into the gas phase. In our experiments we observe a large variety of masses up to 103u. In the talk we will discuss the different molecules which formed and how this formation could have taken place.

We will concentrate on the signals at mass-to-charge ratios of 45, 60 and 75 which we could identify as stemming from formamide, urea and hydrazine carboxamide. These molecules have one carboxy group (CO) and an increasing number of amine groups. At mass-to-charge ratios of 58, 73, 88 and 103 we observe molecules having two carboxy groups and an increasing number of amine groups. All these molecules desorb into the gas phase and show that the formation of longer chain molecules with one or two –CO–NH– bonds takes place in the ices under investigation.

The presented experiments also represent the first in situ observation of urea. That is, urea desorbing into the gas phase from irradiated ice. Earlier experiments were able to only tentatively assign urea after chromatographic analyzation of the residues of the ice at room temperature [5,6].

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