Title

Nitrogen isotopic ratios in amine and nitrile in comets

Abstract

The isotopic ratios are diagnostics for the physico-chemical conditions governing molecular formation. In comets, $^{14}N/^{15}N$ ratios have been measured from HCN in three comets and from CN in more than 20 comets. Those ratios are enriched in ^{15}N compared to the Sun by a factor of ~3, have a small diversity and do not depend on the dynamical type of the comets. The origin of this high ^{15}N -fractionation is still in debate because CN probably comes not only from HCN, but also from other materials (such as polymers or organic dusts) in the coma. Consequently, an interpretation of the isotopic ratios in cometary CN is quite complicated due to the multiple possible parents of CN. In contrast with CN, the isotopic ratios of nitrogen in NH_3 give us a much clearer interpretation than in CN because NH_3 is directly incorporated in the nuclear ices. To estimate the $^{14}N/^{15}N$ ratios in NH_3, $^{14}N/^{15}N$ ratios have been determined from high-resolution spectra of NH_2 in the optical wavelength region. NH_2 is indeed a dominant photodissociation product of NH_3. Those ratios were also found to be enriched in ^{15}N compared to the Sun by a factor of ~3. We discuss the origin and evolution of ^{15}N-fractionation to cometary volatiles based on our data set of $^{14}N/^{15}N$ ratio and previous studies. This work was supported by JSPS, 15J10864 (YS).