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# Experimental study of the contribution of refractory compounds to the cometary atmosphere. Application to the HCN polymers as an origin of the CN extended source.

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Some molecules or radicals observed in cometary atmospheres present so-called “extended sources”. It means that their distribution in comae cannot be explained by a direct sublimation from the nucleus or by the photolysis of gaseous parent molecules. The origin of those extended sources is still an unsolved question but a possible explanation could come from the degradation of solid compounds present on cometary grains. In order to test such hypothesis, a program has been developed coupling modeling and laboratory experiments studying quantitatively the production of gaseous species from the degradation of solid polymers by heating and/or UV irradiation. With this approach, we have shown that $H_2CO$ could be produced by POM ($H_2CO$ polymer) degradation if we suppose that it is present at the few percents level in cometary grains (Cottin et al., 2004, Icarus, 167, 397-416).

In the cometary environment, CN radicals are not produced solely by the HCN photolysis and it has been proposed that it could also be produced from the grains, hence forming an extended source. Moreover, as the Haser parent scale length of CN radical is shorter than the HCN photolysis scale length, if a fraction of CN is coming from the degradation of organics present on grains, then CN radical has to be a primary product.

To interpret the origin of the CN radical extended source, the degradation of HCN polymers has been studied. We have shown by infrared spectroscopy that heating these

polymers leads to $NH_3$ and HCN formation whereas their UV irradiation at 122 and 147 nm produces HCN and $C_2H_2$. The production kinetics by heating and the quantum yields by irradiation of each product have been measured. But, whether HCN is directly released from the polymer or formed after a prompt recombination of CN radicals with H atoms could not be determined. Thus, we have improved our experimental setup to allow the detection of CN radical using pulse laser spectroscopy. LIF (Laser Induced Fluorescence) technique has been developed. With the use of a dye laser, CN is excited through the 0-0 band of its $B^2\Sigma^+$-$X^2\Sigma^+$ transition around 388 nm and we observe its fluorescence at 420 nm in the 0-1 band of the same electronic transition. We will present our latest results acquired with this technique and discuss to which extent HCN polymers can be considered as parent molecules for a fraction of the CN radicals observed in comets.