EFFECTS OF IONIZING RADIATIONS ON THE REACTIVITY INSIDE CLUSTERS OF LINEAR HYDROCARBONS: POLYMERIZATION VS. CYCLIZATION

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Abstract. Recently, Cassini-Huygens mission brought interesting results concerning one of Saturn's biggest satellites, Titan. In fact, it has been shown that this moon's typical orange-brownish haze layers could be due to the presence of aerosols which are essential for it's climate, radiation balance and atmosphere chemistry. However, since it is mainly composed of nitrogen, methane and a small amount of more complex hydrocarbons, understanding the way such PAHs are formed is mandatory (see Zhao L. 2009 and Brown H.R. 2009). Collisions of low energy ions with loosely bound clusters of molecules are studied in the gas phase with the aim to analyze either fragmentation processes, which occur due to the transfer of energy and charge, or, at the opposite, growth processes leading to molecular growth and the formation of new of larger covalently bound molecules. It has been shown that this triggers reactivity, as observed in C60 clusters (see Delaunay R. 2018) or PAH ones (see Delaunay R. 2015). When several atoms are kicked out along the ion trajectory in the cluster large covalently bound systems can be formed. We present results on cluster systems containing linear chain molecules like butane and butadiene. We will discuss the possible formation of ring structures and the path to aromatic molecules. The irradiation of hydrocarbons clusters using different radiation sources (electrons and ions) allows to determine the balance between ionization induced reactivity and collision induced one.

References

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