Formation of molecules on cold interstellar grains

François Dulieu∗1
1LERMA – Observatoire de Paris, Université de Cergy Pontoise – France

Abstract

In 1982, Tielens & Hagen published an article entitled "Model calculations of the molecular composition of interstellar grain mantles" which is now cited 619 times (May 2019), as well as a companion article, signed Tielens, on deutration effects. Almost 40 years later, what progress has been made on the topic of the formation of molecular mantle on interstellar dust? Has the formalism of the model been reformed? Were the initial guess correct? Have new mechanisms been found?

During my presentation I would like to compare the proposals made in this founding paper, and the last decade experimental studies about the mechanisms of molecule formation on dust grains. In particular, I will compare the formation of water and formamide initially proposed with what is known today. I will address the theme of diffusion and tunnel effect, which are central mechanisms from this founding study. We will then see what remains of this work and the considerable influence it has had on understanding the formation of ice mantles.

If time allows, I will finally show our latest results on hydrogenation and oxidation of the coronene at low temperature.

∗Speaker