Quantum tunnelling reactions in astrochemistry

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Activated reactions in the gas-phase were once thought to play only very minor roles in astrochemical environments, due to their diminishing reactivity at low temperature as described by the standard Arrhenius equation. Although the deviations from Arrhenius behaviour induced by quantum tunnelling effects are not a recent phenomena (see for example [1,2]), these were mostly seen to result in a stabilization of the rate constant as the temperature falls [1-3]. Nevertheless, over the past few years several studies [4-6] have shown that tunnelling can lead to dramatic reactivity enhancements at low temperature, indicating a need to reconsider the traditional view of activated reactions in astrochemistry. Here, we review this recent work and describe our own efforts in the area of quantum tunnelling reactions.

Références