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# The molecular richness of the diffuse ISM: a tracer of turbulent dissipation

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## Résumé

The diffuse interstellar medium has long been known to harbor a remarkable molecular richness that cannot be understood in the framework of state-of-the-art UV-driven chemistry. Absorption spectroscopy performed with Herschel/HIFI reveals unexpected large abundances of small hydrides that are the building blocks of interstellar chemistry in the diffuse medium. Because they are so abundant and need only small amounts of H<sub>2</sub> to form, these hydrides are new sensitive tracers, in the entire Galaxy of a poorly known component, the diffuse molecular gas. Among them, CH<sup>+</sup> and SH<sup>+</sup> have highly endoenergetic formation routes and have been proposed to be specific markers of turbulent dissipation occurring in diffuse molecular gas. Their elusive origin is therefore much more than a chemical riddle: it is rooted in the physics of the diffuse gas, its turbulent dissipation rate, the formation of molecular clouds and connects with the broader issues of star formation and galaxy evolution.

Herschel/HIFI observations of CH<sup>+</sup> in the direction of nearby starbursts/AGN nuclei have revealed the ubiquitousness of CH<sup>+</sup>. They illustrate the power of absorption spectroscopy of this species, not only to trace poorly known gas phases (low density and low molecular fraction) that may comprise important mass fractions, but also, and more importantly, to follow the path of the energy, down to its actual dissipation, in these active galaxy nuclei. This opens a new field of investigation from ALMA and NOEMA.

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