Almost 200 molecules have been detected in the interstellar medium (ISM) and circumstellar shells. A very large fraction of these are complex organic molecules (COMs). COMs are traditionally defined as carbon-based molecular species with more than six atoms in their structure [1, 2]. COMs have been detected in the ISM since the 1970s (e.g. CH$_3$CHO or HCOOCH$_3$ [3,4]). Most of the detections were reported toward hot cores (warm and dense gas surrounding high-mass protostars) and toward hot corinos (the low-mass analog of hot cores). More recently, enhanced abundances of specific COMs and precursors have been inferred in other environments: cold pre-stellar cores [5, 6], post-shocked gas in protostellar outflows [7], and photodissociation regions illuminated by strong UV radiation fields [8, 9].

The presence of COMs in the ISM is thus more widespread than initially expected. The formation of COMs in different environments reflects the complex interplay between gas and grain surface chemistry. However, the particular formation pathways of specific COMs are not fully understood, and may not be the same in all environments. As the census of increasingly complex molecules will increase in the years to come (including their detection in protoplanetary disks), more astrochemical models, laboratory experiments and theoretical investigations of possible gas-phase and grain surface routes will be needed to distinguish between different formation scenarios.

In this contribution I will briefly summarize (from an astronomer point of view) the most recent detections and compare the inferred COMs abundances in various environments. I will emphasize the role that an enhanced UV photon flux may have in the resulting abundances of specific COMs.

References