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Attempt to catch the C/O transition in dust formation in cold plasma experiments

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The formation of dust in the envelopes of evolved stars is still poorly understood. It is generally admitted that the C/O ratio in the envelope is a key parameter determining the type of dust that is formed and thus leading to either carbon-rich nanograins, possibly including polycyclic aromatics hydrocarbons (PAHs), or oxygen-rich nanograins mainly silicates.

In order to get further insights into the impact of the C/O ratio on dust nucleation and properties, we are carrying experiments in an axially-asymmetric capacitively-coupled radiofrequency (RF) argon plasma with pulsed injection of hexamethyldisiloxane (HMDSO, C6H18OSi2) that contains key elements associated with the two different families of nanograins in the envelopes of evolved stars. The plasma can be enriched in oxygen by injecting molecular oxygen.

Dust formation in the RF plasma reactor is followed *in situ* by optical emission spectroscopy and the main plasma parameters, the mean electron energy and the electron density are extracted from collisional-radiative modelling. Information on the chemical networks involved in dust nucleation is proposed after *in situ* probing of the molecular content by mass spectrometry and complementary *ex situ* mass analysis following laser desorption/ionisation of the collected dust. Finally, the dust is analysed using standard analytical technics such as electron microscopy, Fourier Transformed InfraRed (FTIR) and X-ray photoelectron spectroscopy (XPS), which reveal two main components: dust particles of ~50 nm size embedded in an organosilicon matrix. In this poster we discuss how the results obtained from different diagnostics interconnect and complete the analysis in order to reveal the mechanisms involved in dust nucleation and growth in the cold plasma reactor, with potential input to our understanding of dust formation in evolved stars.

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