

The STARDUST machine: dust analogue formation

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Star death is the beginning of STARDUST. The STARDUST machine is a newly developed experimental setup dedicated to the simulation of the atmosphere of dying star, and subsequent analysis of the formed dust and molecules. Here we present the part of the machine where the simulation of the atmosphere takes place. We comment on the concessions one has to make when going from the universe to the laboratory.

In the framework of the European project ERC Synergy Grant “Gas and dust from stars to the laboratory: Exploring the NANOCOSMOS, specialists in astrophysics and surface science come together to change our view on the origin and evolution of cosmic-dust. Here the surface science team presents part of the Stardust machine, designed to simulate and analyse *in-situ* the laboratory the formation of molecules in the dust formation zone (Figure 1). In particular, we will focus on the simulation part of STARDUST, where the seed and molecule formation of dust analogues take place (see abstract by G. Santoro et al. for the analysis part). This part of the equipment is a combination of a sputtering gas aggregation source called Multiple Ion Cluster Source (MICS) coupled to in-house designed processing chambers (NEON). The MICS is a versatile equipment that allows a precise fabrication of nanoparticles (NPs) of controlled size, composition and structure in ultra-high vacuum (UHV). Care has been taken to add additional ports to the MICS, enabling us to characterise in detail the formation of the first seeds, or inject additional gasses during the seed formation. NEON consists of several sub-modules that will allow for size selecting, heating, and acceleration of the NPs, as well as interaction of the NPs with controlled background gasses. Modules can be taken out or added, depending on the required experiments. We will present the first proof-of-concept results of the combination of MICS and NEON.

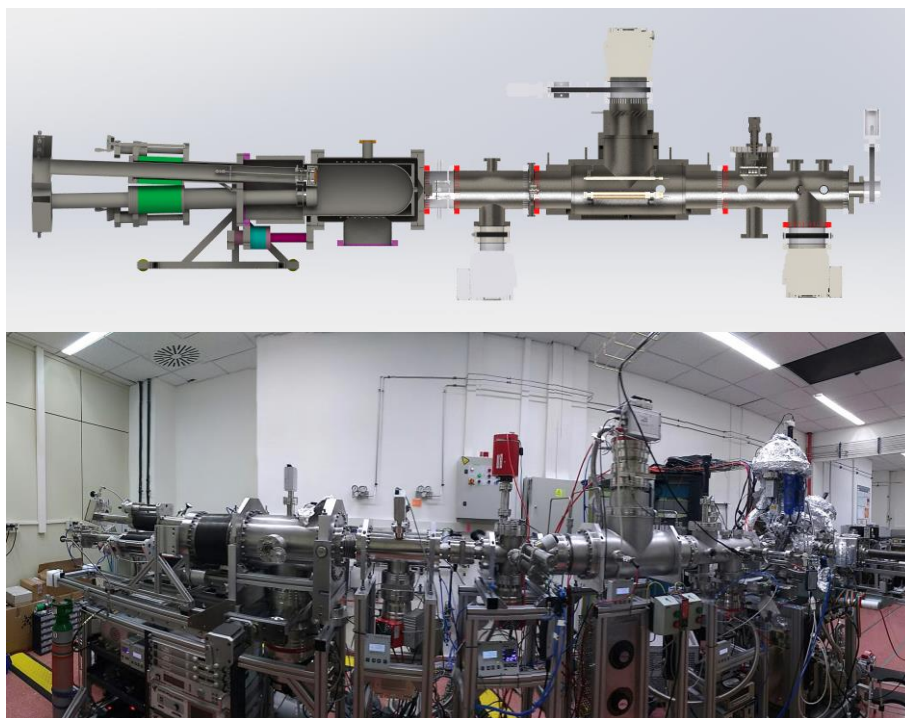


Fig. 1: The STARDUST machine.