Launch of a New Molecular Beam Machine

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We present a new molecular beam machine (fig .1) capable of elucidating the formation of carbonaceous molecules relevant to combustion chemistry and astrochemistry. The machine includes the following critical components:

1. **Main Chamber (MC)** is a 304 stainless steel box (120 cm × 120 cm × 70 cm; 778 L). Minimum pressure 10^{-11} Torr.
2. **Reflection Time-of-flight mass-spectrometer** (**RETOF**) with a max mass resolution m/Δm=200. A preamplifier Ortec 93061, a discriminator F-100T (ARI Corp), and a multi-scaler (MCS8A-2-T8 Fast Comtec) are used for data acquisition.
3. **Source Chamber (SC)** is located inside the MC so that the reactant beam goes between a repeller plate and an extraction grid of the RETOF.
4. **Pulse Valve.** The piezo-electric valve is designed for generation of short gas impulses (80 μs) at high repetition rates and high gas flow.
5. **Pyrolytic source.** Consists of a resistively heated tube of 22 mm length, 1 mm inner diameter; the achievable highest temperature of the tube was estimated to be around 1300-1400 K.
6. The frequency **tripling gas cell**, into which 355 nm pulsed, seeded Nd:YAG tripled laser radiation is focused, is used to generate soft VUV (118 nm, 10.5 eV). The tripling cell contains a mixture of Xe and Ar gas (~1/10, 200 Torr).

The fragmentation-free spectrums of the different hydrocarbons were obtained. The new machine will allow us to measure product distributions for various unimolecular (pyrolytic) and bimolecular reactions under combustion-like conditions.

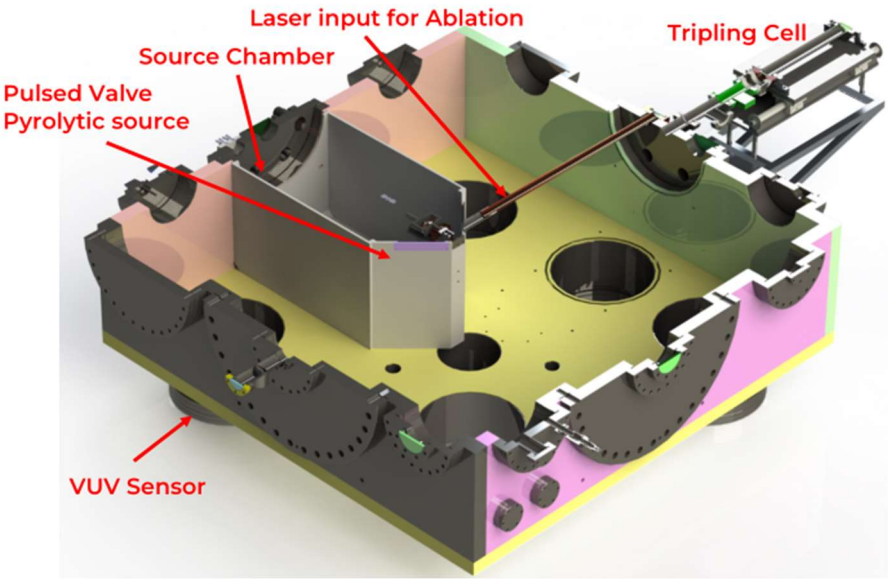

Fig. 1. Section view of the machine.