Identification of renewable products with low environmental impact for automotive use by evaluating their role on the formation of secondary atmospheric particulate matter

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Anthropogenic activities contribute significantly to the formation of secondary particulate matter, i.e., that formed by transformation of inorganic pollutants (SO_2 and NO_x) and unburned hydrocarbons into the atmosphere: volatile organic compounds (VOCs) and intermediate-volatile organic compounds (IVOCs).

The scientific literature agrees that fuel reformulation is a crucial choice to reduce the formation of gaseous precursors that form secondary organic aerosol (SOA) in the atmosphere, although it is still unclear how different fuel fractions may affect the reduction of secondary particulate matter.

The aim of the work is to identify renewable fuels with low environmental impact with Eni through a bottom-up approach (directly analyse automobile exhaust gases). Primary and secondary pollutants of fuels with different composition will be evaluated through various analytical tools.

To recreate atmospheric conditions under which secondary aerosol formation reactions can take place, exhaust gases are piped inside an oxidation flow reactor (OFR) as shown in the figure.
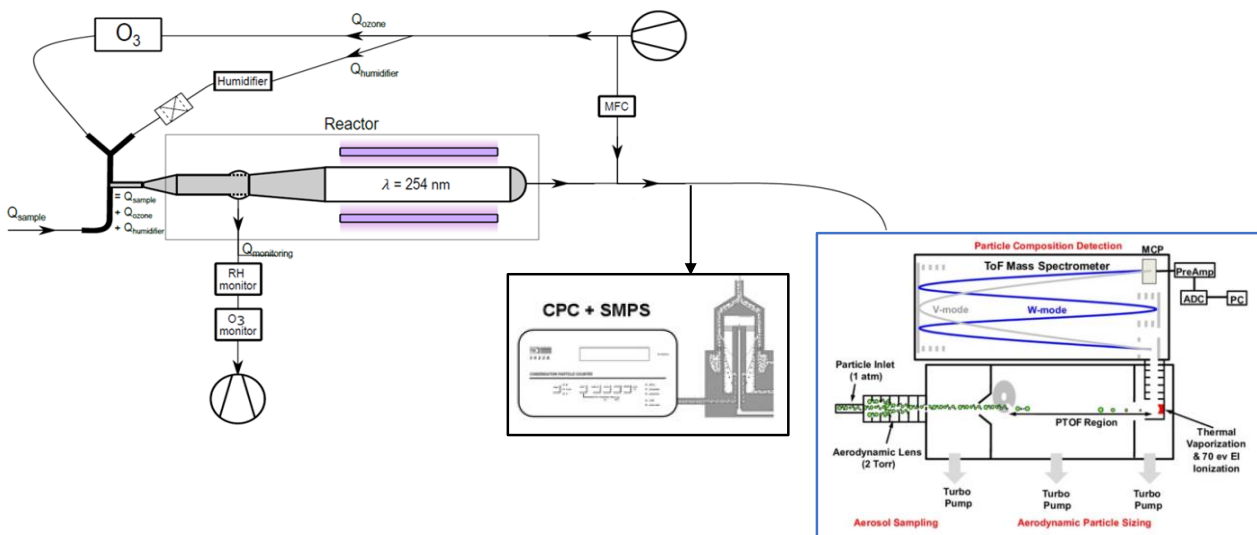
My work will focus primarily on evaluating how different fuel composition may affect the formation of Secondary Organic Aerosol; the main analytical tool is a high-resolution aerosol mass spectrometer (HR-ToF-AMS) through which is possible to analyse the mass spectra of an aerosol sample.

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