PROPORTIONAL CONDENSATION SAMPLER FOR AIRBORNE FLUORINE COMPOUNDS

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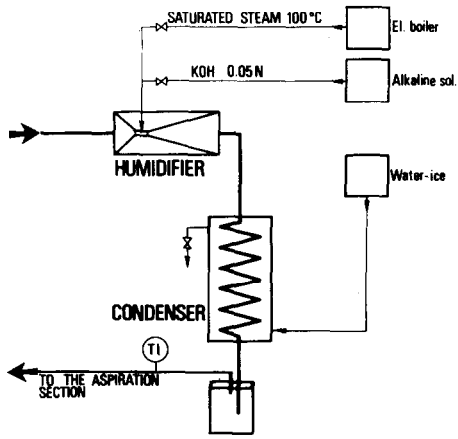
In sampling air and gaseous emissions for the determination of fluorine compounds concentration, the most critical part of the sampling equipment is the fluorine trap.

Today, the methods prevalently used throughout the world involve capture of the pollutant by bubbling the sampled air through an alkali solution, in bubblers of glass diffuser and impinger with inertial diffuser type. It has been observed, however, that in some conditions (sampling of high temperature emissions, measurements of very low air concentrations of fluorine), the traditional bubbling method does not seem always able to ensure the optimum capture conditions, namely:

- constant conditions of capture;
- high fluorine concentrations absorbed in the sampling solution;
- possibility of sampling relatively high flow rates of air per unit volume of the absorbing solution.

The sampler described in this paper, and whose schematic representation is shown in the figure, seems able to satisfy the above mentioned conditions. The systems is in two steps:

1. Conditioning (humidifying) of the air taken in to give a saturation temperature of about 50°C, by the introduction of an alkali solution and/or saturated steam at 100°C;
2. Condensation of the air-steam-alkali solution mixture, through cooling to a temperature below 20°C.



The fluorides in the resulting condensate are then analyzed via a potentiometric determination.

The humidifier consists of a Venturi tube, made in teflon,suitably sized (throat diameter of 1,5 mm, for an air velocity of 50 m/s with an aspiration rate of 5 l/min). The condenser consists of a teflon tube of 1,5 m lenght and 4 mm internal diameter; this is wound as a descending helix and immersed in a receptacle of water, which flows from botton to top and has an inlet temperature of 0°C.

With this sampler constant capture conditions are ensured during the whole sampling period; the quantity of collected liquid, and consequently the dilution conditions of fluorine can be easily controlled.

The reliability and the efficiency of the sampler, as well as the reproducibility of the measurements, have been verified by several comparative tests.