HONO-Source

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Introduction:

The HONO source is an instrument to continuously produce pure HONO mixtures in humidified air with a flow rate of 0.5 - 2 l/min. HONO formation is based on the reaction of $NaNO_2$ with H_2SO_4 in diluted aqueous solution similar to the study by *Taira and Kanda* (1990). However, in contrast to this study, a temperature controlled stripping coil is used as liquid/gas reactor instead of a bubbler, as described by *Kleffmann et al*. showing much faster time response of a few minutes (see Fig. 1).

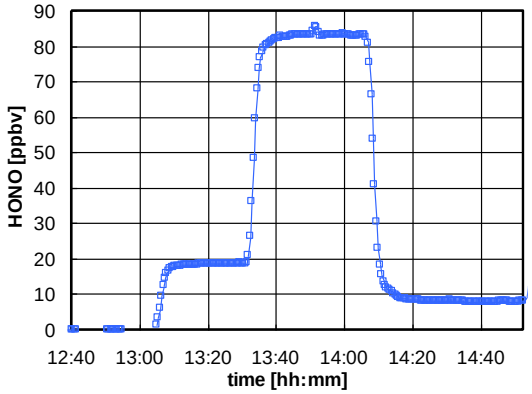

Fig.1: Example of varying the HONO concentration by changing the nitrite concentration.

Each data point reflects a 30 s period.

The time response of the HONO-LOPAP instrument used here to measure HONO was 3 min.

When operated at low HONO concentration (<100 ppbv) the source produces pure HONO/air mixtures humidified at the temperature of the stripping coil (dewpoint), which can be varied in the range 5-20°C. Impurities of nitrogen oxides (NO_x = NO + NO_2) were found to be <1 %. The HONO concentration (1-100 ppbv) is linearly correlated to the nitrite concentration used and thus, the concentrations can be easily adjusted (see Fig. 2). The precision of the source is typically ca. ± 1% (see Figure 3).

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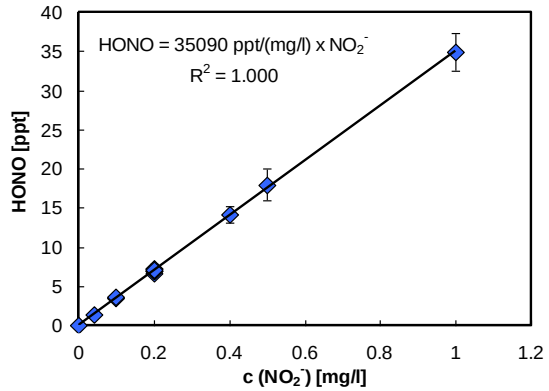

Fig. 2: HONO concentration of the HONO source as a function of the nitrite concentration used.

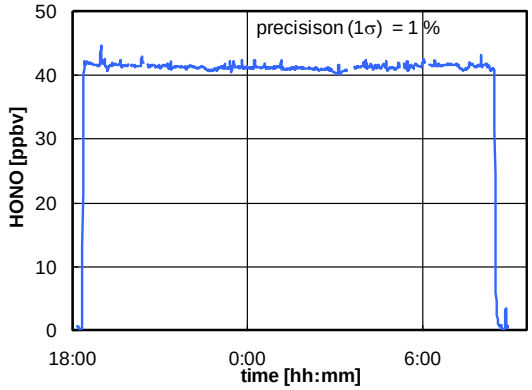

Fig. 3: Precision of the HONO source. Noise may also be caused by the noise of the HONO-LOPAP instrument used to measure HONO (1 % precision). Thus, the given precision of 1 % of the HONO source should be considered as an upper limit.

While the source produces stable and pure HONO, absolute concentrations have to be determined by an accurate HONO detection method, e.g. using a HONO-LOPAP instrument, since the HONO output of the source is depending on several variables (nitrite concentration, gas and liquid flow rates, pH of the mixed nitrite and H_2SO_4 solutions, temperature of the stripping coil). However, when this is once done at fixed experimental conditions the absolute HONO concentration of the source can be calculated simply by the nitrite concentration used and the measured flow rates of the diluted nitrite and H_2SO_4 solutions, for which a simple equation is provided with the instrument.

References:

Taira, M., Y. Kanda: Continuous Generation System for Low-Concentration Gaseous Nitrous Acid, *Anal. Chem.*, 1990, **62**, 630-633.

Kleffmann, J., T. Benter, P. Wiesen: Heterogeneous Reaction of Nitric Acid with Nitric Oxide on Glass Surfaces under Simulated Atmospheric Conditions, *J. Phys. Chem. A*, 2004, **108**, 5793-5799.

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