P-01

Poster Session Day 1

δ^2H, $\delta^{17}O$ and $\delta^{18}O$ variations in condensation water from CH_4 combustion: isotopic tracers and non-mass dependent fractionation?

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δ^2H, $\delta^{17}O$ and $\delta^{18}O$ analyses in condensation water derived from combustion methane in a dynamic open system with excess of oxygen, has been carried out (home condensation gas-fueled boiler). Condensation temperature (Tc) was between 35 and 60°C. Observed variations in δ^2H value (-142 to -115 ‰), $\delta^{17}O$ and $\delta^{18}O$ values (-11 to +16 ‰ and +22 to +31 ‰, respectively) were not always relevant to the atomic masses. δ^2H, $\delta^{17}O$ and $\delta^{18}O$ show poor correlation with Tc, but usually were higher at lower Tc. This chaotic variations can be resulted from: 1) variations in concentrations and isotopic ratios in atmospheric O_2, the combusted CH_4, atm. water vapor (humidity), 2) formation and loss of the H and O containing compounds e.g. CO_2, CO, NOx, OH, CnHm, solids, 3) kinetic isotopic effects resulted from not complete condensation, 4) non-equilibrium and non-mass depended fractionation (NMDF) especially due to a sudden cooling of the combustion products along the turbulent flow in the open chimney. The observed large scatter of $\delta^{18}O/\delta^{17}O$ ratios suggest that the NMDF takes place which does not necessarily depend on Tc.

The weak point is that we did not control any of the above 4 factors. Strong points or added values of this experiment are: 1) apparently a new applications for triple isotopic H_2O (esp.^{17}O) studies are proposed, and 2) showing a simple method of home-made production of ^2H-depeted and ^{17}O- and ^{18}O-enriched tracer water, with additional facts that usually there is no linear relations between $\delta^{17}O$ and $\delta^{18}O$ values. Such unique 3-dimensional water isotopic tracer would be very useful in numerous laboratory experiments (mechanism/balance of chemical reactions, water mixing/migration etc., production of unique lab. standards etc.). Often lab., water isotopic traces are: 1) ^2H- and/or ^{17}O- ^{18}O-enriched, 2) δ^2H, $\delta^{17}O$ and $\delta^{18}O$ are often parallel to GMWL, 3) expensive. This is not the case in the proposed tracer possible to produce in hundreds of liters at home for free.