

One-step Preparation of Gravimetric CO₂-in-air Standards

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The NOAA Global Monitoring Division maintains the mole fraction scale for CO₂ used by the WMO Global Atmosphere Watch program. That scale is defined by 15 primary standards (modified natural air) value-assigned using the NOAA CO₂ manometer. We have recently identified a potential bias in the manometric measurement (X2007 scale ~0.04% too low). In order to better understand this bias and move towards a scale revision, we have prepared CO₂ standards using an independent method. Recent advances in our understanding of the behaviour of CO₂ in aluminum cylinders (drift) and experiments to characterize the adsorption of pure CO₂ to stainless steel surfaces enable the preparation of gravimetric CO₂-in-air standards with relatively low uncertainty. Five gravimetric standards, of nominal range 350–500 ppm, were prepared in 29.5-L aluminum cylinders. The gravimetric standards compare well with a proposed revision of the WMO X2007 CO₂ scale, confirming a ~0.04% bias. This work supports our efforts to maintain the WMO CO₂ scale.

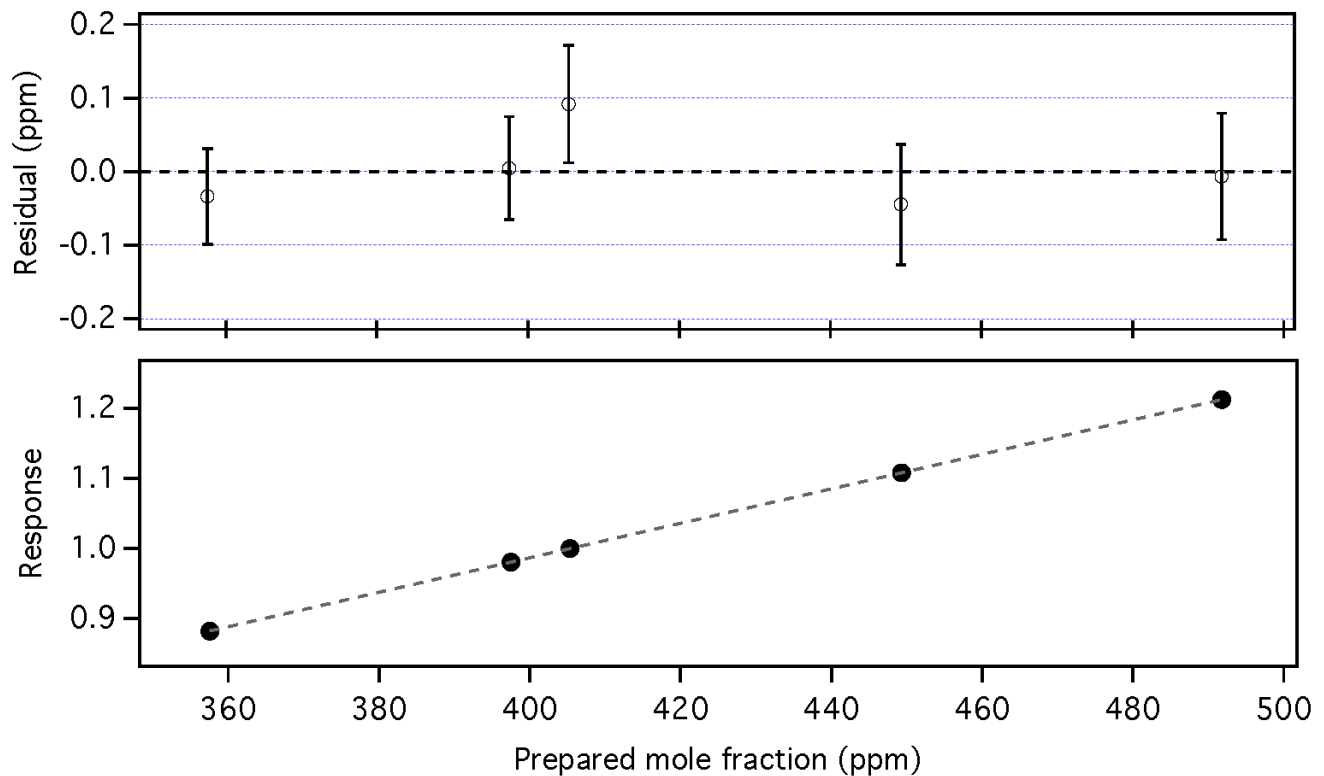


Figure 1. Comparison of five gravimetric CO₂ standards, analyzed by laser spectroscopy.