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Studies of transport and collection characteristics of gaseous mercury species in natural gases using amalgamation and isotope dilution analysis

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Mercury (Hg) is an important quality parameter in natural gases because of its adverse effects on the environment and on metal components in gas production facilities. One of the most frequently applied methods for the determination of gaseous mercury (Hg(g)) in natural gases uses double amalgamation of Hg on Au-Pt wire and detection by atomic absorption or atomic fluorescence spectrometry (AAS and AFS, respectively). This method has been evaluated in field measurements and a procedure for its application is available through the 6978-2 ISO standard method. For most applications the method works satisfactorily, but occasionally and for reasons unknown, results are found to be variable, in particular for sour gases (i.e. acidic gases, containing high concentrations of, e.g. hydrogen sulphide, carbon dioxide, or mercaptans).

We have performed studies of transport and collection characteristics of gaseous mercury species (Hg^0, $(CH_3)_2Hg$, CH_3HgCl, $HgCl_2$) in natural gases using amalgamation and isotope dilution analysis. The studies involve different Au-Pt collection tube designs, tubing materials and gaseous matrices, including air, natural and sales gas, as well as methane and sales gas to which hydrogen sulphide has been added.

The collection efficiency for amalgamation tubes was found to be both Hg species and sample matrix dependent. Hg^0, which is considered to be the dominating gaseous Hg specie in natural gas, did not show any difference in the collection efficiency for the different gases tested. Stainless steel tubing, which is prescribed by the 6978-2 ISO standard method for determination of Hg in natural gas, was found to give temperature dependent analyte losses and memory effects in the presence of high concentrations of hydrogen sulphide, typical of sour gases.