Complex multi-tool analysis of the composition of coal fire gases and related condensates in the Upper Silesian heaps: the first-time utilization of the *in situ* FTIR measurements by GASMET DX4000 system

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The GASMET DX4000 portable FTIR gas analyzer of OMC ENVAG, equipped with gas conditioning system was used for the first time to *in situ* gas measurements in burning coal mining heaps of Upper Silesia, Poland. The main goal was to broaden the otherwise limited analytical range offered by the simultaneously engaged gas chromatography (MS, EC and FID, with special sample pre-treatment, samples analyzed at the University of Irvine, California) and the rough determinations via Dräger indicatory tubes. The certified GASMET qualitative and quantitative analyses obtained thanks to the CALCMET software allowed to control the variation of both organic (some main hydrocarbons; formaldehyde, acetic acid, phenol and *o*-cresole, dimethyl sulphide, dimethyl disulphide, CCl_4; various halogenated hydrocarbons; heterocycles: thiophene, pyridine, furan and tetrahydrofuran) and inorganic compounds (H_2O, CO, CO_2, N_2O, NO, NO_2, SO_2, NH_3, HCl, HF, AsH_3, SiF_4, and $GeCl_4$), most of the latter being unmeasurable by other methods. Large amounts of $GeCl_4$, sometimes around 1000 and possibly up to 3130 ppm, encouraging further potential recovery studies were discovered. Analysis of residual spectra indicates presence of many trace gases, of which the most likely and genetically imporant are iodocyanoacetylene, nitrosyl iodide, iodosomethane, many nitriles (e.g., acetonitrile and dicyanoacetylene), silanenitrile, and thiirene, to mention some (NIST Chemistry WebBook). Some worse-fitted compounds include (fluoromethylidyne)phosphine and thioxoethenylidyne radical. This abstract is related to the first large report of the NCN 2013/11/B/ST10/04960 grant (the financial support), that is under way.