Contribution ID: **951** Type: **Verbal**

Methods for the determination of biomass content in solid recovered fuels

Thursday, 19 May 2022 11:00 (20 minutes)

The European Union has a long-term objective to reduce greenhouse gas emissions causing global warming. In 2005, the so-called Kyoto Protocol entered into force, which introduces a system of emission allowance (EUA) that creates gradually increasing financial pressure on companies emitting CO2. This agreement distinguishes between carbon, which comes mainly from the combustion of fossil fuels (fossil carbon), and so-called biomass carbon, which is defined as carbon occurring in all material of biological origin. If the company proves that it has combusted biomass carbon, then the portion of CO2 produced in this way is removed from the EUA.
Methods for carbon characterization are described in the standard ČSN EN ISO 21644: 2021 *Solid recovered fuels –Methods for the determination of biomass content*, which came into force in August 2021. There are reported three options for determination of biomass content: Selective dissolution method (SDM), Manual sorting method (Msort), and method based on determination of C-14. SDM and Msort have quite a lot of limitations for example higher content of rubber or plastics or small particle size. On the other hand, C-14 method is the most universal, however, it has requirements for high-tech measuring equipment.
Central analytical laboratory - testing laboratory (CAL-TL) in ÚJV Řež a.s. has been performing an accredited determination of biomass carbon content since 2009. The method is based on the determination of C-14 content in CO2 from combusted solid recovered fuel (SRF) sample using liquid scintillation counter (LSC).
The tube furnace consists of the 1st zone where 2 g of sample is placed and the 2nd zone where the CuO catalyst is located, which ensures complete oxidation of the flue gases. The temperature in the area with the catalyst is constant at 800 ℃, while in the 1st zone the temperature gradually increases up to 1000 ℃. A mixture of O2 and N2 gases flow through the whole system. The O2 content raises with increasing temperature up to 100% oxygen atmosphere. The flue gases are then purged in several bubblers and the CO2 is trapped into ice-cooled amines-based trapping solution.
The trapping solution is then weighted into a measuring plastic vial and mixed with scintillation cocktail in ratio 1:1. A coal sample is combusted together with each set of samples, which represents a pure fossil source and therefore zero value of biomass carbon. On the other hand, 100% biomass carbon content is represented by the oxalic acid standard, which is also combusted with each set of samples. The samples prepared in this way are then measured by low background LSC for 24 hours each.
Demand for the determination of biomass content will undoubtedly increase as rising EAU costs and energy companies switch from traditional fossil to alternative sources.

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Session Classification: Environmental Radioactivity

Track Classification: Radionuclides in the Environment, Radioecology