Basic investigations on thermochemical degradation of PFAS in laboratory and pilot plants to determine optimum combustion conditions for the thermal treatment of PFAS-containing waste materials

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Project partners:

- Federal Institute for Materials Research and Testing (BAM) (project management)
- Karlsruhe Institute of Technology (KIT), Institute of Technical Chemistry (ITC)

More than 4,800 per- and polyfluorinated alkyl substances (PFAS) are currently known. They are verifiable in the environment, e.g. in soils and water bodies. The EU is currently examining a comprehensive prohibition on these substances in products which are used in different areas of life such as household, leisure, technology and industry [1]. After use phase, these products end up either in industrial or domestic waste. In thermal waste treatment, the long-chain polymers are broken down under prevailing operating conditions and react mainly to HF, CO_2 and H_2O [2]. Questions to be clarified include the fate of short-chain PFAS compounds in the exhaust gases and the determination of these compounds. The US Environmental Protection Agency (EPA) has developed the "Other Test Method 45 (OTM 45)" with the aim of investigating the degradation of PFAS on a laboratory scale, which already allows the analysis of 50 PFAS compounds from gases. However, it is questionable whether 50 selected out of 4,800 possible compounds are representative for a reliable statement.

Hence, in this project, in cooperation with BAM and ITC, an investigation of airborne PFAS as a sum parameter is to made enable. BAM has already established such a method for compounds in the solid and liquid phase [3].

The project comprises five scientific work packages (see Figure 1): WP1 will serve a comprehensive literature study on the state of knowledge for analytics and analytical methods as well as on the thermal degradation of volatile PFAS. WP2 deals with the development and optimisation of an extraction method for volatile PFAS. This includes the optimisation of adsorber materials and the separation of fluoride. A sum parameter method for the quantitative detection of volatile PFAS compounds will be developed in WP3 using high resolution-continuum source-graphite furnace molecular absorption spectrometry (HR-CS-GFMAS). This method will be compared with the target analysis. The measurement method developed in WP2 and WP3 will afterwards be used in WP4 at the pilot plant KLEAA (Karlsruher Laboranlage zur Ermittlung des Abbrandverhaltens von Abfällen, engl. Karlsruhe Laboratory Plant for Determining the Burning Behaviour of Waste) in combustion tests with different boundary conditions and input materials to analyse the PFAS emissions. With this facility at KIT-ITC, the

combustion behaviour of PFAS can be investigated under similar operating conditions as in a waste incineration plant. The project is concluded with a comparison of methods in WP5.

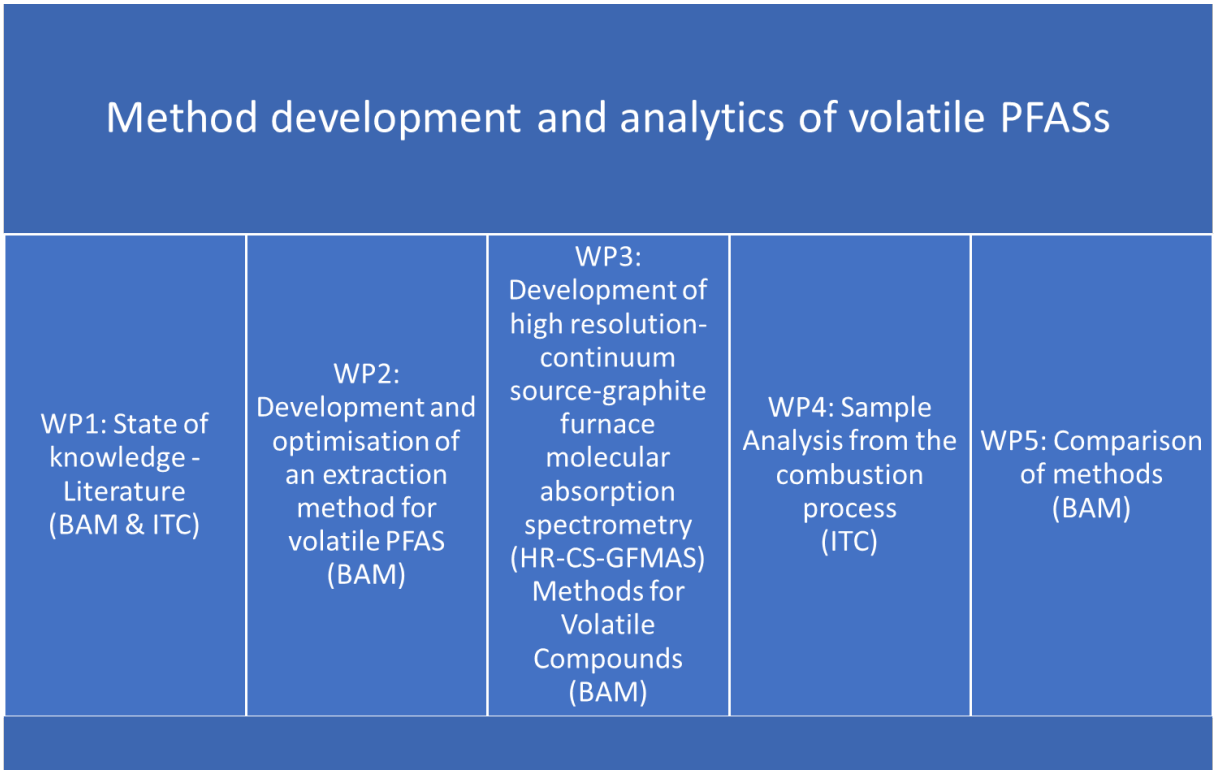

Figure 1: Workload of the project

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