Stable carbon isotopic values ($\delta^{13}C$) of biofuel in Lithuania

A. Garbaras[1], A. Lipovec[1,2], A. Masalaite[1] and V. Remeikis[1]

[1]Center for Physical Sciences and Technology, Vilnius, LT-02300, Lithuania
[2]Faculty of Physics, Vilnius University, Vilnius, LT- 10222, Lithuania
Keywords: $\delta^{13}C$, aerosol particles, biofuel.
Presenting author email: garbaras@ar.fi.lt

Introduction

Research on the origin of aerosol particles is important for understanding the climate change, environmental pollution and environmental self-cleaning processes. Atmospheric aerosol absorbs and reflects radiation from the Sun and heat radiation from the Earth, thus changing thermal balance of the planet. Aerosol absorbs gases, chemical elements and compounds, influences water condensation processes, stimulates photocathalytical reactions and has influence on the global chemical processes in the atmosphere [Ceburnis et al., 2005].

Stable carbon isotope method is one of the methods which are more and more implemented in the source apportionment studies [Ceburnis et al., 2011]. Due to the ability to preserve source isotopic ratio this method can be used as source fingerprint and allows distinguish an aerosol sources if they differ in the isotopic ratios. Because of that, the need to have the database of the possible aerosol sources arises. The $\delta^{13}C$ values of main aerosol source pools are known, but there is a lack of data on more precise spatial distribution of isotopic ratios, as these ratios are varying depending on the geographical region.

As biofuel is becoming more popular comparing to the fossil fuel, the demand to know the isotopic ratios of different types of biofuel arises, and usage of these isotopic ratios to assess the part of aerosol particles which is coming from the biofuel. Carbon isotopic ratio of the emitted aerosol particle depends not only on the burning conditions but also on the plants used. Therefore, the knowledge of the plants carbon isotopic ratio is highly needed

The aim of this work is to measure the carbon isotopic ratio of the main plants, which can be used as biofuel in the regional scale. In the future this database will be used in source apportionment studies.

Methods

In this work $\delta^{13}C$ values of the 24 different plants are presented. Wood, leafs, bark, grain, seeds were measured, 77 positions in total. The samples were collected in the Ignalina region (East Lithuania) during August 2012.

Samples were dried and measured with the elemental analyzer connected to the stable isotope ratio mass spectrometer (*Thermo Flash EA 1112 – Delta V Advantage*).

Results

One C_4 plant was found (maize, $\delta^{13}C$ = -13 ‰). The stable carbon isotopic ratios for the rest of the plants (C_3 type) varied from the -25 ‰ to the -33 ‰. In the Fig. 1 are presented some measurements of the wood $^{13}C/^{12}C$ ratios In order to assess the net aerosol input from the biofuel, the data on the composition of burned biofuel is needed because the biofuel isotopic ratio interfere with the fossil fuel isotopic ratio [Masalaite et al., 2012].

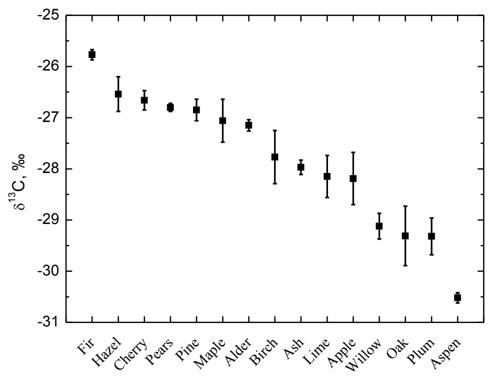

Figure 1. The carbon isotopic ratio of trees which grow in Lithuania and can be used as biofuel. (Wood part isotopic ratio is presented).

Integrated isotopic data from different sources (transportation, domestic heating, fires etc) can be used to perform source apportionment studies of the atmospheric aerosol particles.

This work was supported by the Research Council of Lithuania under grant “Pollution control in biomass combustion: from pollutant formation to human exposure (BioMassPoll) No. ATE05/2012.

Ceburnis, D., Ovadnevaite, J., Kvietkus, K., Remeikis, V., and Ulevicius, V. (2005). *Lith. J. Phys*., **45**(5), 323-332.

Ceburnis D, Garbaras A., Szidat S., Rinaldi M., Fahrni S., Perron N., Wacker L., Leinert S., Remeikis Facchini V. M. C., Prevot A. S. H., Jennings S. G., and O'Dowd C. D. (2011) *Atm. Chem. Phys*, **11**, 8593-8606.

Mašalaitė A., Garbaras A., and Remeikis V. (2012) *Lith. J. Phys.* **52**, 261–268.