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Stable carbon isotope ratio of aerosol particles from internal combustion engine

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Stable isotopes are used in source apportionment of aerosol particles [1]. Also the isotopic ratio can be used for the investigations of the combustion process [2].

The aim of this work is to investigate the carbon isotopic ratio of the aerosol particles emitted by the diesel engine which was fuelled by diesel fuel, mix of diesel fuel and methane or hydrogen, mix of biodiesel fuel with hydrogen. Test engine was equipped with dynamometer. Exhaust aerosol particles were collected on quarts fibre filters. δ^{13}C measurements were performed with an elemental analyser and isotopic ratio mass spectrometer.

The results shows that the diesel fuel had δ^{13}C = -31.3‰while biodiesel was -30.5‰. Fractionation factor for the pure diesel was Δ(aerosol particles-fuel) = 3.2‰. Using mix of diesel fuel with methane increased Δ up to 4.2‰, while mix of diesel fuel with hydrogen had smaller fractionation factor between fuel and aerosol particles. Δ=2‰was observed for pure biodiesel, meanwhile mix of biodiesel fuel with hydrogen had no changes in fractionation factor. Overall, in all set of experiment emitted aerosol particles had δ^{13}C values ranging from -28.3‰to -27.3‰.

Bigger fractionation factor shows better combustion efficiency in the engine and we can conclude that methane enhanced combustion efficiency of the diesel fuel. These experiments shows, that methane is not participating in the aerosol particle formation.

References

1. D. Ceburnis, A. Garbaras, S. Szidat, M. Rinaldi, S. Fahrni, N. Perron, L. Wacker, S. Leinert, V. Remeikis, M. C. Facchini, A. S. H. Prevot, S. G. Jennings, and C. D. O'Dowd, Quantification of the carbonaceous matter origin in submicron marine aerosol particles by dual carbon isotope analysis, Atmospheric Chemistry and Physics, Vol 11, pp. 8593-8606 (2011);

2. D. Widory, Combistibles, fuels and their combustion products: A view through carbon isotopes, Combust. Theor. Model. 10, 831–841 (2006).