NEW DEVELOPMENTS IN THE DIRECT LSC METHOD OF BIOGENIC COMPONENT DETERMINATION IN LIQUID FUELS BY ^{14}C

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Radiocarbon (^{14}C) method is a very powerful method for fast and accurate determination of bio-based fraction in any material containing carbon. Any radiocarbon measurement technique can be applied; however, for liquid fuels the best technique is a direct measurement of liquids mixed with a scintillation cocktail in liquid scintillation counters – the direct LSC technique. At the first conference Natural Resorces, Greeen Technology & Sustainable Development in 2014 we presented a new data evaluation technique for determination of biogenic fraction in liquid fuel by the ^{14}C direct LSC method. The idea was to use various purely biogenic compounds of different colours and quenching properties to construct the "modern calibration curve", as well as various purely fossil liquids to construct the "background calibration curve". The fraction of the biogenic component in an unknown sample was determined as the ratio of net count rates of the unknown sample and the biogenic sample having the same quenching properties. The proposed data evaluation technique depended neither on the fossil matrix nor on the biogenic additive type. It did not require ^{14}C spikes or other expensive standards. One did not need to know the qualitative composition of liquid fuels, as it was the case for other evaluation techniques. Mixtures of biogenic and ^{14}C-free liquids demonstrated the potential of the proposed technique for determining the biogenic fraction of a mixture.

In this presentation we would like to report developments in the direct LSC technique, results of intercomparison studies with other laboratories that apply a conventional evaluation technique, as well as results of determination of the biogenic component fraction in mixtures of various fossil matrices and various biogenic blends. The limit when the count rates of the biogenic and the fossil samples become close to each other or indistinguishable is set to SQP ≈ 700, where SQP denotes the Standard Quench Parameter determined by LSC Quantulus 1220. Below this value the obtained results for biogenic fractions are not reliable. The method gives comparable results with other data evaluation techniques, and the results are very good for SQP > 700. Influence of aging of both original mixtures and prepared scintillation cocktails on SQP and count rate will be discussed.

Keywords: biogenic component, liquid fuels, radiocarbon

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