

Determination of Biodiesel Fuel Content in Blend Diesel by Measurement of Absorption of Short Millimeter Waves

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An increasing number of countries have begun to use biodiesel (BD) with (blend diesel) mineral diesel (MD). For practice it is important to have a fast and non-destructive method for monitoring content of such blend diesel. Dielectric spectroscopy provides an effective method for such monitoring. It is known [1] that at frequencies 1 - 3 GHz the real part of permittivity of MD equals 2.3 - 2.4 and that of BD equals 3.3 - 3.5. Therefore, it is possible to monitor the BD content in blend diesel using microwave dielectric spectroscopy. But there are some difficulties for such monitoring due to the temperature dependence of the permittivity of BD in the microwave band.

In [2] it was shown the peculiarity of application of millimeter (MM) waves for monitoring blend diesel. Here we present an experimental investigation of dielectric properties of BD as well as its mixture with MD. In the MM waves range. It was shown that with help MM waves it is possible to realize nondestructive in real time monitoring content of BD in blend fuel with usual MD. The best sensitivity ensures measurement of blend absorption in the short MM wave region due to high difference in absorption in MD and BD. For example at frequencies 80-100 GHz sensitivity is more than 0.1 dB/1% BD for thickness of blend 1 cm. Contrary to microwave band in this case one does not need to have correction on temperature.

[1] A. Munack, J. Krohl, Biodiesel for modern Dieselmotors, Institute of Technology and Biosystemtechnik, Federal Agricultural Research Centre, Germany.

[2] V.V. Meriakri, E.E. Chigrai, I.P. Nikitin, M.P. Parkhomenko, S.V. von Gratowski, Millimeter waves as a tool for monitoring biodiesel and blend diesel content, 6th Euro Fed Lipid Congress: Oils, Fats and Lipids in the 3rd Millennium: Challenges, Achievements and Perspectives, Athens, 7-10 September 2008, p.96