

## **An Innovative Multivariate approach for Analysis of different Chemical-physical Properties in Biodiesel by FT-NIR Spectroscopy**

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The Fourier Transform – Near InfraRed (FT-NIR) spectroscopy is an extremely advantageous analytical technique for both laboratory applications and industrial productions, since it can offer fast multi-property analysis with a reduced lag time. This work reports about the performance of this technique to determine the content of different biodiesel components (monoglyceride, diglyceride, methanol, total glycerin and linolenic acid) and of some important chemical indexes (acid and iodine value).

As dataset for modeling, biodiesel (B100) samples coming from different feed-stocks (such as soybean, palm, rapeseed, exhausted oil and the related blends in different ratios) have been used. All the samples have been provided and referenced by the National Institute of Oils and Fats (Stazione Sperimentale Oli e Grassi). Partial least square regression has been used to develop the calibration model between analytical and spectral data. Before modeling, spectral data were all conveniently pre-processed. Validation procedures show that models have an accuracy level comparable to what stated by the European EN Standards.

The results highlight that FT-NIR spectroscopy is a convenient technique applied to biodiesel quality control. Models developed can be successfully used, with limited on-site adjustments, in order to reduce laboratory work loads and to help process engineering in continuous on-line monitoring.