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Online reconstruction of oil oxidation kinetics and reaction schemes during deep-frying by deconvolution of ATR-FTIR spectra

Maxime Touffet, Anna Patsioura, Aman Mohammad Ziaifar, Luc Eveleigh, Olivier Vitrac



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1 **Online reconstruction of oil oxidation kinetics and reaction**
2 **schemes during deep-frying by deconvolution of ATR-FTIR**
3 **spectra**

4 Maxime Touffet, Anna Patsioura, Aman Mohammad Ziaifar, Luc Eveleigh, Olivier Vitrac*
5 *UMR 1145 "Food Processing and Engineering" INRA, AgroParisTech, Université Paris-Saclay,*
6 *91300 Massy, France*
7

8 **Abstract**

9 Evaluating and improving the thermal stability of frying oil is of major concern for the whole
10 frying industry, including oil producers and manufacturers of deep-fryers. Online measurements
11 of oil degradation rely on coarse indicators such as total polar compounds (TPC) and free-fatty
12 acids. We propose in this study to increase the "chemical resolution" of rapid tests by proposing
13 point ATR-FTIR measurements for the local determinations of oxidation products in batch and
14 continuous deep-fryers. Based on the deconvolution of four main regions of interest in the mid-
15 infrared range and the identification of ten peaks, we describe the reconstruction kinetics of eight
16 compounds or chemical functions. The whole methodology has been validated on the broad range
17 of temperatures (140-180°C), oxygenation conditions and oil composition described in Ref.
18 [Patsioura et al., *Food Bioprod Process Journal*, 2017, 101, 84-99]. The study illustrated how the
19 local oil composition can be used to discriminate oil oxidation pathways and to analyze the
20 coupling between mass transport, heat transfer and oxidation reactions in connection with the

* Corresponding author. Tel : +33169935063 ; fax : +33169935044 ; *E-mail Address*: olivier.vitrac@agroparistech.fr
(O. Vitrac).

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