

Monitoring crystal development in palm oil-based fluid shortening production by FT-IR spectroscopy.

ABSTRACT

The extent of crystal development of palm oil-based fluid shortening was determined using attenuated total reflectance (ATR) of Fourier transform infrared (FT-IR) spectroscopy. The molten fat was cooled, heated and cooled again while agitating at constant speed. Samples for solid fat content (SFC) measurements by nuclear magnetic resonance (NMR) and FT-IR spectroscopy were taken during the crystallization process at 20C and heating process at 30C. Standards producing the best coefficient of determination (R^2) and standard error of estimation for each temperature, calibrated with the spectrum obtained by FT-IR spectroscopy using partial least square (PLS) chemometric analysis, were selected as the PLS model. The model was independently validated by the "leave one out" method. The model accuracy and repeatability was good with a $R^2 > 0.9$ at 20 and 30C, thus providing good SFC estimates during the production of palm oil-based fluid shortening. The advantage of this method is that it mainly reduces the tedious sample preparation needed for the NMR measurement.

Keyword: Crystal development; Palm oil-based fluid shortening; Fourier transform infrared; FT-IR spectroscopy.