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Optimization of high voltage electric field as a novel non-thermal method of sunflower oil neutralization

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Highlights

High voltage electric field (HVEF) reduced FFAs and PV by 48 % and 57 % in the sunflower oil, respectively;

HVEF can be an alternative method for oil industrial neutralization;

HVEF could remove production of large quantities of soap-stock, consumption of large amounts of water and loss of oil to soap-stock;

Bioactive compounds such as tocopherols and sterols were not affected by the HVEF;

HVEF can be useful for the development of green refining processes of oil.

Abstract

Caustic neutralization produces large amounts of soap-stock. Soap-stock is a byproduct of little value, though it is quite costly to dispose. Water consumption in caustic neutralization is also high. In this study, the high voltage electric field (HVEF) method was used for neutralization of sunflower oil to omit drawbacks of caustic neutralization. Response surface methodology was used to determine the optimum conditions for high voltage electric field (HVEF) neutralization of sunflower oil under laboratory conditions. The voltage (5–15 kV), clay (0–1 %), electrolyte concentration (0–50 mM), the number of electrodes (1–5 pairs), electrode distance (1–3 cm), temperature (55–75 °C), and reaction time (10–30 min) were the factors investigated with respect to free fatty acids contents. A central composite design (CCD), with seven variables and two response functions, was employed to study the effect of the individual variables on the response functions. For responses, the second-order

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