A Response Surface Methodology (RSM) Approach for the Mitigation of 3-MCPD Esters and Related Compounds in Refined Oils

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The formation of fatty acid esters of MCPD (monochloro-propanediol) and glycidyl in edible plant oils during the deodorization step of the refining process has become a serious worldwide problem to the food industry. This especially holds for palm oil as it exhibits a comparatively high formation potential and is applied in the food industry as an essential ingredient on a grand scale. Intensive research has been undertaken to elucidate the formation of MCPD and glycidyl esters and to develop technological reduction approaches aiming at modifications of the refining process and post process separation. An exclusive experimental optimization of the refining process in terms of minimization of MCPD and glycidyl ester formation along with preservation of the desired product quality is limited by the number of process parameters involved and the particular relevant parameter range to be considered. Thus the broad range of possible process parameter settings of a refining process can just be covered broadly by exclusive experimental approaches yielding just a rough estimate of the optimal setting. Here a modeling approach to that problem is presented applying the Response Surface Methodology (RSM) along with tailored statistical experimental design. Based on that approach the refining process has been simulated taking all relevant process and quality parameters into account. An optimum process parameter setting has been identified at which the ester formation is minimized within the range of acceptable product quality.

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