

Overview on the Response Surface Methodology (RSM) in Extraction Processes

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Abstract

Response Surface Methodology (RSM) is an optimization tool that can identify interrelationship between variables as being adopted by experiment/ research studies in food and herbal plants extraction niche area. This review discusses the optimization approach through utilization of research surface methodology either using central composite design or Box-Behnken method specifically in extraction processes. The use of analysis of variance (ANOVA) to evaluate the degree of accuracy held by the derived model is based on several responses. RSM helps to determine the best experimental design in order to identify the relationship between variables. This paper also discusses on the utilization of RSM to derive a model equation that later can be applied for response prediction and the determination of optimal conditions.

Keywords: *RSM, response surface methodology, box-behnken, central composite design, regression.*

1. Introduction

Response surface methodology (RSM) can be described as a technique that involves complex calculation for optimization process. This approach develops a suitable experimental design that integrates all of the independent variables and uses the data input from the experiment to finally come up with a set of equations that can give theoretical value of an output. The outputs are obtained from a well-designed regression analysis that is based on the controlled values of independent variables. Thereafter, the dependent variable can be predicted based on the new values of independent variables [4][5]. Back in 1951 when RSM was first introduced by Box and Wilson [6], the experimental runs were reduced enormously compared to the number of runs determined using full factorial design. Therefore, it has been adapted in many research including food technology where the technical steps can be found explained in details such that by Henika [1,2] and Giovanni [3]. Beside the reduction of experimental runs, the results obtained from RSM are claimed to be statistically acceptable [7].

By applying RSM method in the optimization process, only a short period of time is required to test all of the variables pertaining to the consumer evaluation, making the laboratory test stage more efficient [8]. In addition, parameters estimation can identify the variables that are largely affecting the model which then helps researcher to focus on those particular variables that contribute to the product acceptance [9].

Generally, one factor or process variable can depend on or be depended by another variable in a set of experimental design. The knowledge of the interaction between the factors is crucial in order to find the output-input relationship. This is the reason that the interactions are hardly determined using one-factor-at-a-time approach [10]. By establishing a model equation, RSM can evaluate the

Manuscript History:

Received 13 February, 2015, Revised 17 March, 2015, Accepted 23 March, 2015, Published 30 April, 2015