

Optimization of Process Variables for Pulsed Vacuum Osmotic Dehydration of Model Food Cubes

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Abstract:

Pulsed vacuum osmotic dehydration (PVOD) is an application of vacuum pressure at the beginning of osmotic dehydration (OD). It can introduce mass transfer during impregnation process of foods. The aim of this study was to investigate the optimum conditions to achieve high water removal and solid gain in a model food cube. The process variables were agar-gel cube bulk density (0.65-0.85 g/ml), sucrose concentration (30-60 % w/w) and vacuum impregnation time (10-30 min). The pulse vacuum treatment was applied at 150 mbar for 10-30 min followed by an atmospheric pressure operation up to 180 min. The process was optimized using response surface methodology (RSM). The results showed that water loss (WL), solids gain (SG), weight reduction (WR) and WL/SG were contributed to process variables. Moreover, sucrose concentration was the most effective among all response variables as compared with vacuum time and bulk density. The WR, WL, SG and WL/SG values were fitted to a quadratic model (R^2 0.9920-0.9989). The optimal process conditions for a model food were 0.72 g/ml of bulk density, 58.41 % w/w of sucrose concentration and 11.47 min of vacuum time. The predicted values of WL and SG were 25.57 % and 27.78 %, respectively. This study has revealed that, under the experimental conditions, an appropriate WL/SG ratio will be useful for food formula modification in new product development.

Keywords: Mass transfer, product development, response surface methodology, sucrose, vacuum