FEASIBILITY STUDIES OF FAT-SOLUBLE VITAMINS IMPREGNATION VIA SUPERCRITICAL ROUTES

Pantić M., Knez Ž., Novak Z.

University of Maribor, Faculty of Chemistry and Chemical Engineering, Laboratory for Separation Processes and Product Design, Smetanova 17, 2000 Maribor, Slovenia

Processes based on supercritical fluids allow innovative processing applications that can overcome the limitations of classical liquid based processes. Supercritical fluids have been used in pharmaceutical and food industry due to the environmental ("green") properties. Even more, their high diffusivities and low viscosities allow rapid penetration of the active substances into a high variety of matrices.

In the present work the supercritical impregnation of alginate aerogels with fat-soluble vitamins: 2-methyl-1,4-naphthoquinone (vitamin K_3) and cholecalciferol (vitamin D_3) has been investigated. Due to its poor water solubility, high sensitivity to UV light, oxygen and temperature, vitamin D_3 is a huge challenge for entrapment. Aerogels have been proposed as carriers for many active substances since they possess low densities, large open pores and high inner surface areas. By impregnating these vitamins inside the aerogels, the isolation from environments that promote degradation or undesirable interactions could be achieved. Supercritical impregnation showed to be feasible for entrapment of both vitamins.

Impregnation experiments were carried out with supercritical carbon dioxide at 150 and 200 bar at 40 °C. Therefore, adsorption isotherms were measured and fitted with the Langmuir model. The effect of pressure, vitamin's concentration in carbon dioxide and time of impregnation on loaded alginate aerogels were studied. The loaded alginate aerogels were characterized using scanning electron microscopy and X-ray diffraction. Release kinetics of the adsorbed vitamin D_3 were evaluated by in vitro dissolution tests and results showed that that the alginate aerogels are valuable vehicles for enhancing the adsorption of vitamin D_3.

ISBN 978-963-313-179-4