Influence of electrospraying parameters on microcapsule properties in dual-capillary electroencapsulation – a case study using the Taguchi robust design method

J. Roine*, M. Murtomaa, J.Salonen
University of Turku
e-mail: jtroin@utu.fi

***Abstract* — The effect of multiple electrospraying parameters on the composition and production yield of shell-core structured microcapsules were investigated in dual-capillary electroencapsulation. The shell material was Eudragit E 100 polymer, which together with talc (anti-tacking agent) was dissolved in chloroform for electrospraying. KI-doped glycerol was used as the core liquid, with dispersed porous silicon nanoparticles as a model functional payload. The varied electrospraying parameters included the electrospraying liquid compositions (concentrations of solid constituents and additives), liquid flow rates, the signs and magnitudes of the electrospraying voltages, and temperature. To minimize the number of production trials, the parameter levels were varied simultaneously from trial to trial according to orthogonal arrays, a part of Taguchi robust design methods. The production yield was measured by weighing the collected capsules after a constant time, the composition of the capsules was measured by thermal gravimetry, and the size distribution was determined using optical microscopy. The effective shell thickness, core radius and production yield by component were calculated from the results. The effects of the varied parameters on the observed quantities were estimated by analysis of mean response and the signal to noise ratio (SNR), which was derived from the quadratic loss function in accordance to the Taguchi methods. The quality of the results was evaluated by confirmation experiments, and by combinatory SNR confidence interval analysis.**