

Transformation of cyclodextrin glucanotransferase (CGTase) from aqueous suspension to fine solid particles via electro spraying

Abstract

In this study, the potential of electrohydrodynamic atomization or electro spraying to produce nanometer-order CGTase particles from aqueous suspension was demonstrated. CGTase enzyme was prepared in acetate buffer solution (1% v/v), followed by electro spraying in stable Taylor cone-jet mode. The deposits were collected on aluminium foil (collector) at variable distances from the tip of spraying needle, ranging from 10 to 25 cm. The Coulomb fission that occurs during electro spraying process successfully transformed the enzyme to the solid state without any functional group deterioration. The functional group verification was conducted by FTIR analysis. Comparison between the deposit and the as-received enzyme in dry state indicates almost identical spectra. By increasing the distance of the collector from the needle tip, the average particle size of the solidified enzyme was reduced from 200 ± 117 nm to 75 ± 34 nm. The average particle sizes produced from the droplet fission were in agreement with the scaling law models. Enzyme activity analysis showed that the enzyme retained its initial activity after the electro spraying process. The enzyme particles collected at the longest distance (25 cm) demonstrated the highest enzyme activity, which indicates that the activity was controlled by the enzyme particle size. © 2014 Elsevier Inc..