Computational Modeling and Experimental Evaluation of the Effects of Electrode Geometry and Deposition Target on Electrostatic Spraying Processes

International Journal of Computer Applications
Foundation of Computer Science (FCS), NY, USA

Volume 124
Number 2

Year of Publication: 2015

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10.5120/ijca2015905358
{bibtex}2015905358.bib{/bibtex}

Abstract

Electrostatic force field application is one of the most promising methods for spraying protective liquid sprays onto the biological surfaces of crops, orchards, vineyards and trees, because electrostatic space charge and image deposition forces enhance the uniformity of spray on the target surface and increases the transfer efficiency, mass transfer and adhesion. The study has been carried out to know the effects of electrode geometry, deposition target and spray cloud through computational modeling using COMSOL Multiphysics. In this work, four different shaped targets, four different geometry of electrodes and four stages of spray cloud are analyzed to know the effects of resultant electric field to charge the conductive liquid sprays. Comparative study of electric field among all the four shaped targets resulted that elliptical target has the maximum resultant electric field followed by conical, spherical and cylindrical target respectively. Similarly in case of electrode geometry, electric field of square electrode with circular cross-section found to be optimum followed by circular electrode with circular cross-section, circular electrode with square cross section and square electrode with square
cross section respectively. The experimental results are in good agreement with computational modeling of charging the liquid sprays.

References

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Index Terms

Computer Science

Applied Sciences

Keywords
Aerodynamics, Deposition characteristics, Electrodynamics, Hydrodynamics, Induction charging, Spray cloud