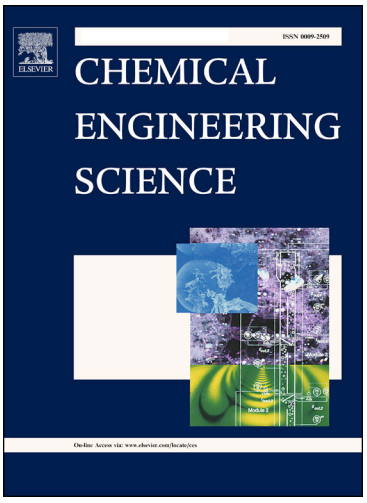

Liquid jet trajectory and droplet path influenced by combined cross flow and electric fields

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Liquid jet trajectory and droplet path influenced by combined cross flow and electric fields

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Abstract

This study investigates an ethanol liquid jet subjected to combination of an air crossflow and a normal electric field. The results on the liquid jet trajectory and subsequent droplets flight paths are presented. The liquid jet trajectory was found as a function of two non-dimensional quantities; the liquid jet to the crossflow momentum ratio and the electroinertial number. The electroinertial number is defined as the ratio between the liquid jet specific momentum and the electric force. A correlation is introduced for the jet trajectory in low crossflow speeds and electric field intensities. The same two quantities control the detached droplets flight paths. Satellite droplets flight angles are also reported with a correlation for their separation angle, which can be useful in applications where uniform droplet production is important.

Keywords: Jet Trajectory, Cross Flow, Electrohydrodynamics, Satellite Droplet

1. Introduction

Liquid jets have been studied largely because of their potential practical use and the interesting physical aspects (Eggers and Villermaux (2008)).