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Simple-jet mode electrosprays with water. Description, characterization and application in a single effect evaporation chamber.

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Abstract

Electrohydrodynamic atomization is a technique which uses the influence of strong electric fields to manipulate the break-up of a liquid, pumped through a capillary nozzle, into droplets. In this work, an extended description of a specific high flow EHDA mode, known as the simple-jet mode, is presented. In it, a short historical view of the different works published about the mode is presented as well as results about investigations done by the authors to characterize the droplet population generated in this mode with varicose and whipping break-up with a special focus on water, as the atomized liquid. Lastly, other experiments were conducted to investigate the relation of this atomization method (also in the simple-jet mode but with varicose break-up only) on droplet in air evaporation, using a single effect evaporation chamber. The liquid used in these experiments was a solution of water and NaCl (35 g·L⁻¹) to provide similar conditions as found in thermal desalination systems. The results have shown that, the manipulation of the droplet diameter, droplet size distribution and spray angle, provide by the application of the electric potential with a constant flow rate in EHDA, could improve the droplet evaporation efficiency up to 40%, when combined with, e.g. forced convection and higher inlet temperatures. Moreover, it can be also concluded that, the easy manipulation of such factors, provided by EHDA, is an important tool which can be used to allow the realization of extended experiments which could help providing more input about the relation of such factors with droplet in air evaporation.

Keywords: Electrohydrodynamic atomization, simple-jet mode, evaporation

1. Introduction

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