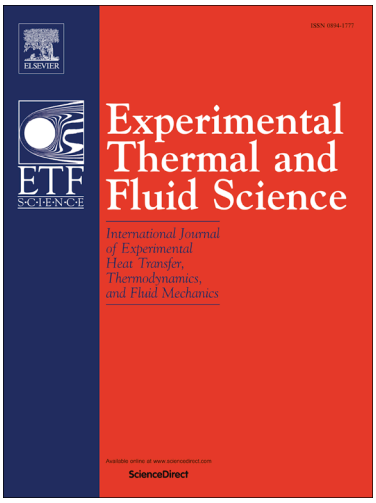

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LED Nanosecond Pulsed Imaging for Electrohydrodynamic Liquid Breakup of a Modified Nozzle

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Abstract

The behavior of an electrified liquid jet breakup and modes of disintegration were investigated at different flow rates and voltages. The current phenomenology belongs to a new injector introduced recently by Morad et al. (2016). This injector has proven to highly extend the stability and flow rate of electrospray particularly in the Taylor cone-jet mode. The experimental investigation was performed using a high-power light-emitting diode (LED) illumination as the light source. The light source was developed to operate in the pulsing condition when synchronized with a digital camera and was particularly designed to function properly in the presence of high electromagnetic interference (EMI). The details of the light source development were observed through the images captured from the jet breakup at different modes. Finally, the operational map of the new injector was obtained, and the physical mechanisms of different behaviors were examined.

Keywords: Electrospray, Primary Atomization, High Power Pulsing Light Source, Shadowgraphy, Electromagnetic Interference

1. Introduction

Electrohydrodynamic atomization (EHDA) is based on electric stresses focusing a liquid exiting from an injector into a very tiny jet. This jet disintegrates into droplets around twice smaller than the orifice diameter due