Proceedings of the 8th World Congress on Mechanical, Chemical, and Material Engineering (MCM'22)
Prague, Czech Republic – July 31, 2022 - August 02, 2022
DOI: 10.11159/icmie22.001

Micro-Explosion of Composite Droplets and Intensive Secondary Atomization

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Extended Abstract

Puffing and micro-explosion phenomena are the most interesting effects of secondary atomization [1–4]. Primary atomization systems based on spray technologies help to achieve limited ranges of droplets sizes due to some technical limitations [4,5]. In these cases secondary atomization (especially micro-explosion and puffing) in diesel combustion chambers, power engineering systems, heat exchange chambers and reactors proved to be effective in increasing of droplet surface area before and after puffing/micro-explosion (100-120 times), decreasing in anthropogenic emissions of NO_x and SO_x (more than 20%) and saving fuel (more than 2%) [3–5]. The aim of this keynote lecture is to describe puffing and micro-explosion of composite droplets and their intensive secondary atomization with estimation of gas temperature, droplet configuration, droplet sizes effects and etc. Some of the most recent experimental and modelling results concerning the puffing/micro-explosion of composite droplets are presented and discussed. The experimental and theoretical results refer to images of droplets during puffing/micro-explosion, times to puffing/micro-explosions, droplet radii history and measurements of the temperatures inside the droplets. Typical images of these phenomena are shown in Figure 1. Work on this extended abstract was supported by the National Research Tomsk Polytechnic University.

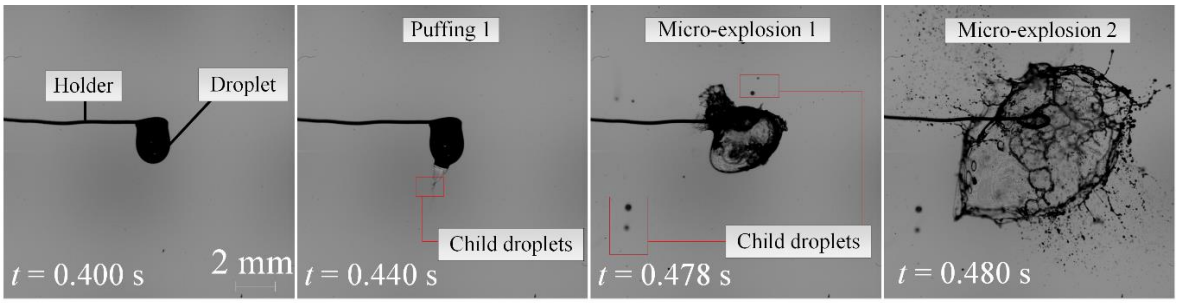

Figure 1. A typical images of the puffing/micro-explosion phenomenon.

Keywords: Composite Droplets, Heating, Evaporation, Puffing, Micro-explosion, Secondary Atomization

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