

Spray Characteristics of Prefilming Type of Airblast Atomizer

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Abstract

The spray characteristics of a prefilming type of airblast atomizer were experimentally investigated. Firstly, we observed the breakup phenomena at the wall edge of the liquid film flowing over the solid wall using the high-speed video movie. By the observation at the wall edge, the liquid film deforms into the bag-shaped sheet, which consists of a thin liquid film attached to a thick rim. The thin liquid film disintegrates into numerous fine droplets, and the thick ligaments attaching to the wall edge remain. Then the thick ligaments disintegrate into coarse droplets. The new numerical model of a film breakup at the wall edge was proposed. The new model assumes that the mean droplet diameter is determined by the coarse droplets generated by the breakup of a ligament attaching to the wall edge. So, concerning to the new breakup model, we focused on the ligament breakup. The numerically predicted wavelength, ligament diameter and mean droplet diameter were compared with the experiments. The predicted characteristics, such as wavelength, ligament diameter and mean droplet diameter, were almost coincident with the experiments except at low air velocity. The droplet mass flux was measured by the isokinetic probe. The droplet mass flux distributions are expressed by a normal distribution function which is normalized with a maximum flux at the center and half width at half maximum.

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