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An Investigation of the Electrostatic Atomization Phenomena

Hajime FUJIMOTO*

In this report, the effect of the static electricity on the disintegration of a liquid jet and on the drop size of distilled water is investigated with a simple apparatus using an injection syringe.

On the liquid jet, the following results are obtained.

1) The static electricity increases the rate of the atomization and creates peculiar phenomena such as sinuous flow, zigzag flow and winding flow. These phenomena are more remarkable on liquid of a larger dielectric constant.

2) At the jet velocity of about 1 m/s. — the region of sinuous flow —, the effect on the atomization is most remarkable.

3) Liquid of a smaller dielectric constant has a region of a smooth flow at voltages as high as 35 kilovolts.

4) By dimensional analysis, the nondimensional number II_1 is calculated. This is the ratio of the force on hydrodynamics to that on electrostatic field and has the meaning such as Reynolds number.

On the droplets of distilled water, the following results are obtained.

1) In the region of the sinuous and wavy flow, droplets descend in a circular spiral motion.

2) In the region of the zigzag and winding flow, the droplets descend in an elliptic spiral motion.

The mean drop size measured along the major axis is greater than the one along the minor axis.

3) The mean drop size becomes smaller as the distance between the measuring point and the origin becomes greater.

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