Title	An investigation of the electrostatic atomization phenomena
Sub Title	
Author	藤本, 元(Fujimoto, Hajime)
Publisher	慶応義塾大学藤原記念工学部
Publication year	1966
Jtitle	Proceedings of the Fujihara Memorial Faculty of Engineering Keio University (慶応義塾大学藤原記念工学部研究報告). Vol.19, No.76 (1966.) ,p.220(2)- 220(2)
JaLC DOI	
Abstract	
Notes	Summaries of Doctor and Master Theses Master of Engineering, 1966
Genre	Departmental Bulletin Paper
URL	https://koara.lib.keio.ac.jp/xoonips/modules/xoonips/detail.php?koara_id=KO50001004-00190076- 0002

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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 liguid 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 creats 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 H_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 measused 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.

