

锥-射流模式下毛细管静电雾化流场的PIV测量 Investigation on Electrostatic Spray of Capillary in Cone-jet Mode Using PIV

王贞涛 毛惠敏 罗惕乾

江苏大学

关键词: 静电雾化 锥-射流 雾滴速度 粒子图像速度场仪

摘要: 采用粒子图像速度场仪测量了毛细管微射流静电雾化流场, 获得了毛细管静电雾化的典型雾化模式和锥-射流模式下雾场中雾滴的速度矢量图与流线图, 分析了雾滴在输运过程中的受力情况和静电电压作用下的速度与流线变化。实验结果表明: 在静电力与极化力、重力、流体拖曳力等共同作用下, 随着荷电电压的增加, 雾场流线分布均匀, 雾滴在轴线上速度逐渐增加。在任一电压下, 随着射流轴向距离的增加, 同一截面上雾滴速度都有所增加, 且速度的均匀性沿轴向有所提高。 A particle image velocimetry (PIV) was used to measure the cone-jet flow in electrostatic spray. The mode of spraying was observed. The droplets' velocity and flow vector graphs were analyzed. Streamlines field under different voltages were obtained. The forces acted on the droplets in their transportation and the change of the velocity and flow field were analyzed. The experiment indicated that, with the increasing of voltage, the flow field was distributed uniformly and the droplets' velocity along the axes increased with electrostatic forces, polarization forces and fluid forces together. With the increasing of axes distance, the droplets' velocity in the same section along the radius increased under the same voltage, and the velocity uniformity in the same section improved.

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