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现代应用光学

液滴半径与其侧向散射光通量关系的实验研究

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摘要： 喷雾雾滴直径的瞬时全场分布测量对其微观特性的研究具有重要的意义。为开发一种基于侧向散射光通量的喷雾液滴直径全场测量方法，在理论推导的基础上，利用均匀液滴射流发生器对液滴半径与其侧向散射光通量之间的关系进行了实验研究。利用数字相机在不同的侧向散射角下，对水和O#柴油的单粒径液滴射流在不同粒径下的侧向散射光通量进行了测量，并对它们之间的关系进行了分析。实验结果表明：液滴半径与其侧向散射光通量之间存在明显的二次函数关系，拟合的相关系数大于0.98；侧向散射角的大小以及液体的种类均不会改变两者之间的二次函数关系，仅影响该关系式系数的大小。为基于侧向散射光通量实现喷雾雾滴直径的全场测量提供了重要依据。

关键词： 喷雾 液滴半径 侧向散射光通量 单液滴射流

An experimental study on the relationship between droplet radius and its lateral scattering luminous flux

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Abstract: The measurement of spray droplets diameter distributions is of great significance for the research of spray's microscopic characteristics. In order to develop a measurement method which based on the lateral scattering luminous flux, on the basis of the scattering theory, this contribution studied the relationship between the droplet radius and its lateral scattering luminous flux by using a uniform diameter single droplet stream generator. The lateral scattering luminous flux of two different liquids, water and O# diesel, were measured under different droplets diameters, through a digital camera from different lateral scattering angles, and the relationship was analyzed. The experimental results show that a quadratic function relationship exists between the droplet radius and its lateral scattering luminous flux, the correlation coefficient is greater than 0.98; the lateral scattering angle and the kind of the liquid do not change this quadratic function relationship, but they will affect the coefficient of the quadratic function. It provides an important basis for spray droplets diameter distribution measurement.

Keywords: Spray Droplet radius Lateral scattering luminous flux Single droplet stream

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