

燃油粘度与环境压力对喷雾碰撞过程的影响 Investigation of the Influences of Droplet Viscosity and Environmental Pressure on the Spray Collision

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关键词: 内燃机 喷雾模拟 碰撞模型 燃油粘度 环境压力

摘要: O' Rourke碰撞模型仅仅考虑了碰撞拉伸分离以及聚合, 而忽略了碰撞反弹、反射分离以及高韦伯数下的碰撞二次破碎过程, 在碰撞分区过程中也忽略了燃油物性以及碰撞环境条件的影响, 使得预测的碰撞分区临界韦伯数偏低。复合碰撞模型根据相关的实验结果对碰撞分区进行油滴粘度以及碰撞环境压力修正, 考虑碰撞反弹、反射分离、拉伸分离以及碰撞二次破碎过程, 提高了碰撞分区的预测精度。基于复合碰撞模型, 分析了油滴粘度与环境压力对喷雾碰撞过程的影响。结果表明环境压力的增加, 使得碰撞反弹概率增加而聚合概率下降; 燃油粘度的增加使得碰撞聚合比例增加而碰撞分离比例下降。 The stretching separation and coalescence are only considered in the O' Rourke model while the bounce, reflexive separation and the secondary breakup under high Weber collision are ignored. Furthermore, the influences of droplet property and collision condition on the collision regimes are not included in the O' Rourke model so that the predicted critical Weber numbers are underestimated. In the composite collision model, the collision regimes were revised to consider the influence of droplet viscosity and environmental pressure, and the bounce, coalescence, reflexive separation, stretching separation and the secondary breakup under high Weber collision were also considered. Moreover, the influences of droplet viscosity and environmental pressure on the spray collision were investigated based on the composite collision model. The results showed that the probability of bounce was increased due to the increasing of environmental pressure while the probability of coalescence was decreased. However, the probability of coalescence was increased with the increasing of droplet viscosity while the probability of collision separation was reduced.

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