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Abstract
In the past, the impinging drop utilized to study the impingement onto a hot plate was mainly in a single phase. However, the impact phenomena of this kind of drop are not always suitable for the system associated with blending fluids. In this study, several types of oil drop, namely, diesel, W/O emulsion diesel, and bio-diesel were used to impinge a hot plate well above the Leidenfrost temperature. By using high-speed video camera, the collision behaviors were observed, and the maximum spreading diameter and resident time were measured. According to the experimental results, we found that the collision behaviors including the critical Weber number for disintegration, the maximum spreading and the resident time depend strongly on the viscosity of the impinging drop. For both the W/O emulsion diesel, and the bio-diesel, the critical Weber number for disintegration increases with increasing the viscosity. In contrast, the maximum spreading as well as the resident time decreases with increasing the viscosity. We also found that for the same impacting Weber number the W/O emulsion diesel drop and the bio-diesel drop whose viscosity was controlled to the same value with the former exhibited different results in both the maximum spreading and the resident time. In the last, by considering the effect of viscosity, two empirical equations were derived to predict the dimensionless maximum spreading and the resident time, respectively. Both of them were in good agreement with the experimental data.
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