

Visual study of the freezing process of a water droplet on a horizontal copper plate

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Abstract

Freezing on cold surfaces can cause equipment damage. To prevent the increase of ice, it is necessary to understand the freezing process of water droplets on the cold surface. This study based on the droplet shape analyzer, the freezing process of droplets is studied visually. The effects of the substrate temperature, ambient relative humidity, and volume of droplets on the freezing process were analyzed. It is found that the influence of ambient relative humidity and substrate temperature on the supercooling time are related to the degree of supercooling. When the substrate temperature is lower than the critical supercooling degree, the effect of substrate temperature and the ambient relative humidity on the supercooling time is weakened. With the increase of volume, the supercooling time decreases first and then increases. In the phase transformation stage, there is a positive correlation between the change of phase transformation time and the influencing factors.

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