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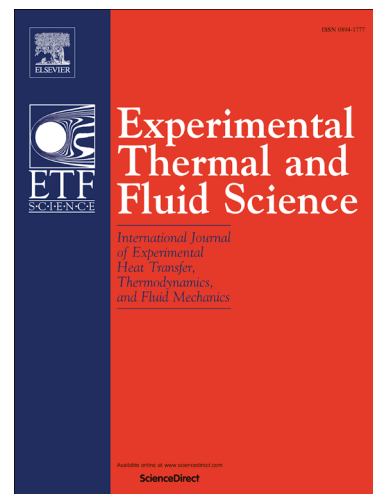
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Experimental study on the evaporation characteristics of the kerosene gel droplet

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Abstract

The purpose of this study is to investigate the evaporation characteristics of a single kerosene gel droplet experimentally. An isolated kerosene gel droplet with an initial diameter of ~2mm is suspended at the welding point of a thermocouple wire, and is suddenly exposed to an elevated temperature (in the range of 100 to 500°C) at atmospheric pressure (0.1Mpa) under normal gravity. The droplet changing process is observed and recorded by a high-speed image formation system. The results indicated that the evaporation process of a single gel droplet can be divided into three stages: the stage of the evaporation of kerosene; the stage of the gellant layer formation; the stage of the swell of the gellant layer and microexplosion taking place. Several unique phenomena, such as bubble nucleation, gellant layer formation, disruption of gellant layer, and slight explosion of the initial droplet were observed. Then the $d_n^2/d_0^2 - t_n/d_0^2$ curve was acquired by processing the images, which indicated that the evaporation rate of kerosene gel resembled the evaporation rate of pure kerosene droplet at a relative low temperature. However, microexplosion would occur when the environment temperature exceeds the boiling point of kerosene.

Keywords: kerosene gel; single droplet; evaporation

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