

传递现象

滴状冷凝初始液滴的形成机理

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摘要 滴状冷凝初始液滴形成机理一直是悬而未决的问题。鉴于镁能与热水(冷凝液)反应,反应后镁表面的化学成分将发生变化,采用金属镁作为冷凝表面,在实验中通过控制过冷度和冷凝时间而实现蒸汽在镁表面的初始冷凝。然后应用电子探针(EPMA)技术分析冷凝前后试件表面化学成分的变化,用于推断蒸汽的初始冷凝状态。实验结果表明,镁表面氧元素的含量随着过冷度和冷凝时间增加而明显增加,并且氧元素在镁表面的分布是不均匀的。这些结果说明在固体表面上发生初始冷凝时凝液是成核状态的,而不是成膜状态。因此,滴状冷凝初始液滴形成机理符合成核中心假说。

关键词 [滴状冷凝](#); [初始液滴](#); [电子探针](#); [纳米](#); [机理](#); [镁](#)

分类号

Mechanism of initial droplet formation in dropwise condensation

Abstract

The mechanism of the formation of initial condensate droplets for dropwise condensation is still not clear. Magnesium was used as condensation surface in this study since it can react with hot water (condensate) and thus make the chemical composition of the surface changed. In the experiments, the initial condensation of steam on the magnesium surface was achieved in the designed apparatus by controlling subcooling and condensation time. Then, the test surface was scanned with an electron probe microanalyzer (EPMA) for the variation of the chemical composition of the surface before and after the initial condensation, which can be used to deduce the state of the initially formed condensate, whether in nuclei or in thin film. The results showed that the oxygen contents on the test surface increased with subcooling and condensation time obviously after initial condensation. And the oxygen on the test surface was not distributed uniformly. It indicated that the initial condensate was formed in nuclei on the solid surface, but not in thin film. Therefore, the mechanism of the formation initial condensate droplets for dropwise condensation accords with the hypothesis of surface nucleation sites.

Key words [dropwise condensation](#); [initial condensate nuclei](#); [EPMA](#); [nanometer](#); [mechanism](#); [magnesium](#)

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