

多相流和计算流体力学

## 电场作用下冷态单气泡形成过程

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摘要

对氮气泡在电场作用下的形成过程进行了可视化研究。实验观察到电场作用下气泡生长的动态图像; 研究表明, 电场作用下气泡沿场强方向伸长, 随着场强的升高, 气泡的脱离长径比增大, 脱离体积减小; 另外利用Matlab编程从实验中取得实际气泡生长的轮廓线, 对气泡界面的电应力计算显示, 气泡顶部受到电拉力作用, 两侧受电压力作用, 从而使气泡产生了沿场强方向的伸长变形。这表明气泡界面受到的电应力是气泡产生变形的主要原因, 该结果有助于电场对沸腾传热强化机理的研究。

关键词

[电流体动力学](#) [气泡生长](#) [电应力](#)

分类号

## Formation of a single bubble under adiabatic condition in electric field

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### Abstract

The formation of a nitrogen bubble under adiabatic condition in the electric field was visually investigated. The bubble's dynamic growth was observed in the electric field. The bubble elongated along the direction of the electric field. With increasing electric field strength, the bubble's aspect ratio at the departure increased while the departure volume decreased. The bubble contours were extracted from the experimental images by means of Matlab toolboxes. The electric stresses on the actual bubble surface were calculated, which indicated that the electric stress exerted on the bubble tip pulled the bubble while that exerted on the bubble sides pressed the bubble, causing the bubble elongation deformation along the electric field direction. The bubble deformation resulted primarily from the effect of the electric stresses acting on the bubble surface. It helps to analyze further the effects of electric field on nucleate boiling heat transfer.

### Key words

[electrohydrodynamics](#) [bubble growth](#) [electric stress](#)

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