多相流

高频脉冲电场作用下乳状液液滴动力学模型

张建[1]；董守平[2]；甘琴容[3]

中国石油大学机电工程学院[1]

胜利工程设计咨询有限公司[2]

摘要　基于乳状液中液滴在电场中的受力情况的分析，建立了W/0乳状液中液滴振荡固有频率公式，从理论角度分析和解释了高频脉冲电场对W/0乳状液的破乳机理，从力学的角度分析了最佳频率存在的理论基础，并推导出了最佳频率的计算公式。该固有频率与液滴尺寸、界面张力、黏度、温度、密度等有关。为了验证最佳频率公式的可靠性，用正辛烷乳状液进行了室内实验。实验结果表明，理论最佳频率公式的预测结果与实验测得的最佳频率结果吻合，经修正后与白油实验结果也非常接近。

关键词　　乳状液　高频脉冲　破乳机理　电场

分类号

Dynamic model of liquid droplets of water-in-oil emulsions with high-frequency pulsating electrical field

Abstract

A mathematical model of the inherent frequency of liquid droplets in water-in-oil（W/O）emulsions was developed from the force balance analysis of the liquid droplets with the presence of external electrical field. The demulsification mechanism of high-frequency pulsating electrical field was proposed and it was proved theoretically that there existed an optimum frequency for the best demulsification performance. A prediction model was developed for calculating this optimum frequency. It was also shown that the inherent frequency was dependent on droplet size，surface tension，viscosity，temperature and density. The experiments of the n-octane and the white oil W/O emulsion were carried out to prove the reliability of the prediction model. The theoretical prediction of the mathematical model for optimum frequency agreed well with both the experimental results of the n-octane W/O emulsion and the modified experimental results of the white oil W/O emulsion.

Key words　emulsion　high-frequency pulsate　demulsification mechanism　electrical field

DOI:

通讯作者　张建 slecczj@sina.com