عنوان مقاله:

Behavior of a Water Droplet Falling in Oil under the Influence of Electric Field

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نویسندگان:

B. Khorshidi - *Department of Mechanical Engineering, University of Tabriz*

M. Jalaal - *Department of Mechanical Engineering, University of Tabriz*

,E. Esmaeilzadeh - *Department of Mechanical Engineering, University of Tabriz*

F. Mohammadi۴ - ۶*Department of Electrical and Computer Engineering, Ryerson University*

خلاصه مقاله:

The use of electric field is a promising technique for separating stable water–oil emulsions. Field induced charges on the water droplets will cause adjacent droplets to align with the field and attract each other. The present work experimentally studies the effect of uniform D.C electric field on the kinematics of a water droplet falling in oil. Experimental setup consists of a test cell which was made by transparent Plexiglas. Two rectangular copper plates were used as high and grounded electrodes. The electric field was perpendicular to the direction of the droplet motion. Applied voltage was varied up to 1.4 kV. The droplet motion was recorded using a high-speed camera with speed of 600 fps. A dedicated code was developed to post process the images, obtaining the main geometrical parameters of the droplet. For details, finite element method (FEM) was used to simulate the 2D electric field around the droplet. The additional forces due to the application of electric field were derived starting from the Maxwell stress tensor, and their expressions, along with the droplet geometry derived from image processing, were implemented in Comsol Multiphysics code, that calculated the electric field configuration around the drop and the value of the electric forces acting on its interface. Outcomes demonstrate that the falling droplet is deviated through the high voltage electrode due to the external electric force which is calculated in the numerical section. The deviation increases by growth of .applied voltage. Moreover, smaller droplets experience stronger oblique

کلمات کلیدی:

Droplet, EHD, Water-oil, D.C. Electric field