

## عنوان مقاله:

Innovations in Non-Linear Oscillations of a Pendent Drop From a Capillary Tip During Formation and Detachment - An LBM Simulation

## محل انتشار:

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## خلاصه مقاله:

Individual drops are suitable tools to study the liquid-fluid interfacial properties. In this work, forcedisplacement equation and non-linear oscillations of a pendent drop are numerically investigated. The presented novel force-displacement function allows following the dynamics of a pendent drop and realizing its elastic behavior. The growth and detachment of drop, which is pending due to gravity from a capillary tip, is considered (assuming high density and high viscosity ratios and immiscible two-phase flows). Twodimensional multi-relaxation time lattice Boltzmann method (MRT-LBM) was used to simulate growth, detachment, and oscillations of the drop using a conservative model for high-density ratio. The forcedisplacement function of a pendent drop (FDFPD), which is non-linear, was introduced. Using FDFPD, the non-linear elastic specifications of the pendent drop were determined. It was realized that the drop shows three different elastic behaviors simultaneously (hardening, linear, and softening). The drop superharmonic and subharmonic frequencies were calculated, using the natural frequency of the linear portion of FDFPD. Besides, the drop would grow as long as its displacement is between the extrema of FDFPD. In addition, a dynamic criterion for the onset of detachment was established. Also, increasing the Bond number from ۰.۱۱ to ۱.۹۶, while keeping Reynolds number equal to ۰.۰۲۳, accelerates the drop detachment and increases the linear portion of FDFPD. It was shown that increasing Capillary number from  $۱.۸E-۵$  to  $۷.۳E-۴$ , while keeping Reynolds number equal to ۰.۰۲۳, accelerates the drop detachment and increases the non-linear portions of FDFPD.

## کلمات کلیدی:

Growing drop, Phase flow, Two, Drop non, linear oscillations, Lattice Boltzmann method, Drop dynamics

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