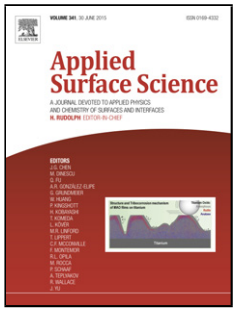

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The relationship study between texture vibrating plate dynamic wettability and elastic wave scattering

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Highlights

- Experimental investigate the vibrated droplet motion behavior.
- The dynamic behavior of vibrated droplet is unstable.
- Theoretical calculate the elastic wave scattering with two holes.
- Performance of the influence of elastic wave scattering on wetting property.
- Droplet emerge movement is response to the local vibration.

Abstract: An experimental investigation of wetting behavior of liquid droplet on texture vibrating substrate and the theoretical calculations of elastic wave scattering with two holes which based on the elastodynamics, employing complex functions are investigated to study the relationship between texture vibrating plate dynamic wettability and elastic wave scattering. Experimental results show the dynamic behavior of droplet was unstable. In 0 to π/2 cycle, droplet appeared the waveform with front steep and rear gentle along the flow direction. In π/2 to π cycle, droplet appeared slightly periodic oscillation and accompanied by a certain ripple. Based on the dynamic wetting phenomenon in a single cycle, the influence of elastic wave scattering on wetting property are analyzed. Analysis has shown that the stress concentration is caused by complex elastic wave scattering. The more concentrated the stress, the more concentrated the elastic wave energy. Compared with the single hole, the variations of dynamic stress concentration factors for two holes are complex due to the influence of interaction between two holes. Droplet emerge movement is response to the local vibration. The vibration spread in elastic plate at a time of strain, this elastic force cause droplet displacement and vibration, and accompanied with energy transfer.

Keywords: dynamic wettability; vibrate; metal; elastic waves scattering; stress concentration

1. Introduction

The wetting behaviors of liquid droplet in vibration state become a research hotspot in the fields of fluid interface in recent years[1-3], and this kind of research has been widely used in engineering, especially in the field of fluid machinery. Lv propose a new type of water droplet transportation mechanism on a microstructured hydrophobic surface, which could be very helpful in designing liquid droplet transportation devices in microfluidic systems[4]. Hao propose a new