عنوان مقاله:

A Liquid Jet Impinging onto Rotating Convex Superhydrophobic and Hydrophilic Surfaces: Reflection or Deflection?

نویسنده:

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خلاصه مقاله:

A liquid jet impinging on stationary and rotating superhydrophobic and hydrophilic convex surfaces is experimentally investigated. The effects of the rotation and wettability of the surface and the inertia and impingement rate of the jet on the flow, and the reflection and deflection behavior of the impinging jet are examined. This study examines the effect of air film formation at the constantly regenerating interface between a superhydrophobic surface and a liquid jet. For this purpose, two copper pipes and one plexiglass pipe, which had outer diameters of ۸, ۲۲, and ۵۰ mm, were used for the convex surfaces. The copper pipes were coated with a superhydrophobic coating with a ۱۵۷° apparent contact angle. The uncoated plexiglass pipe had a ۷۳° apparent contact angle. The Reynolds and Weber numbers ranged from ۱۰۸۲ to ۳۴۴۳ and from ۳.۹۰ to ۳۵.۱۲, respectively. The liquid jet was sent to the rotating convex surfaces at different impingement rates. The experimental results show that the impinging liquid jet is reflected off the stationary superhydrophobic surface. This reflection behavior is not nearly distributed from the rotation of the superhydrophobic convex surface. The distribution increases slightly with an increase in the Reynolds or Weber numbers, the diameter of the convex surface, and the impingement rate. Nevertheless, the impingement liquid jet is deflected off the stationary hydrophilic surface. This deflection increases considerably with the rotation of the convex surface. The renewal of the air film between the superhydrophobic surface and the liquid significantly reduces the viscous drag force. Therefore, the impinging liquid jet cannot be dragged by the rotating superhydrophobic convex surface.

کلمات کلیدی:

Superhydrophobicity, Liquid jet, Reflection jet, Liquid solid interface, Wettability, Jet impingement

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