A PIV study of flow characteristics in a valveless micropump

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Abstract

This paper presents an experimental study on flow characteristics in the pumping chamber of a valveless micropump by using the PIV method. The PIV measurements were specially arranged such that the transient flow velocity fields at various moments in one pumping cycle were captured. The results show that, during the pumping phase and sucking phase, the flow characteristics near the chamber outlet are asymmetric in terms of vortex patterns, so that a net pumping flow is produced. The PIV results agree qualitatively well with the numerical simulated flow streamlines, and confirm that the flow rectification mechanism in this valveless micropump is due to the asymmetric flow velocity fields in the pumping chamber.