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## Incapability of laser drilling affected by interfacial transport processes across the induced keyhole

Peng-Sheng Wei National Sun Yat-Sen University, Taiwan (ROC)

This study theoretically identifies the factors affecting the keyhole collapse during drilling with a high power density laser beam. Laser drilling is widely used in various manufacturing technologies. This work studies quasi-steady one-dimensional compressible flow behavior of the two-phase vapor-liquid dispersion in a vertical keyhole of varying cross-section, paying particular attention to the transition between the annular and slug flows. The results find that the effects of transport processes across the induced keyhole wall affected by surface tension, friction force, and liquid entrainments on incapability of drilling. The predicted results agree with physical intuition and exact closed-form solutions in the absence of friction and energy absorption. Controlling the factors to enhance efficiency and quality of drilling is therefore provided in this work.

## Biography

Peng-Sheng Wei has received his PhD in Mechanical Engineering department from University of California, in 1984. He was a Professor in the Department of Mechanical and Electro-mechanical Engineering of National Sun Yat-Sen University, Kaohsiung, Taiwan, since 1989. He has contributed to the understanding and applications of electron and laser beam, plasma, and resistance welding through theoretical analyses coupled with verification experiments. He has published more than 80 journal papers and has given keynote or invited speeches in international conferences more than 70 times. He is a Fellow of AWS (2007), and a Fellow of ASME (2000). He also received the Outstanding Research Achievement Awards from both the National Science Council (2004), and NSYSU (1991, 2001 and 2004), the Outstanding Scholar Research Project Winner Award from National Science Council (2008), the Adams Memorial Membership Award from AWS (2008), the Warren F Savage Memorial Award from AWS (2012), and the William Irrgang Memorial Award from AWS (2014). He has been the Xi-Wan Chair Professor of NSYSU since 2009, and is an Invited Distinguished Professor in the Beijing University of Technology, China (2015-2017).

pswei@mail.nsysu.edu.tw