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Stages for pore formation during fabrication of porous materials

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The pore shape in solid as a result of entrapment of a bubble by a solidification front is predicted in this work. Pore formation in solid influence microstructure of materials and contemporary issues of biology, engineering and climate change, etc. This work extends previous models by accounting for realistic mass and momentum transport across a self-consistent shape of the bubble cap. It is found that there exist three stages of solute concentration at the cap or solute gas pressure in the pore during solidification for initial contact angle greater than 90 degrees. Significant drops occur in the early stage and end of a middle stage at which solute concentration at the cap is about that in liquid far from the solidification front and contact angle is near 90 degrees. On the other hand, solute concentration at the cap exhibits two stages in most cases. The predicted pore shape agrees with experimental data. Increases in mass transfer coefficient and solidification rate decrease the pore radius. The predicted pore shape agrees with experimental data.

Biography

Peng-Sheng Wei has received his PhD from Mechanical Engineering Department at University of California, Davis, in 1984. He has been 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 advancing the understanding of and to the 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, given keynote or invited speeches in international conferences more than 90 times. He is a Fellow of AWS (2007) and a Fellow of ASME (2000). He has 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 invited Distinguished Professor in the Beijing University of Technology, China, since 2015.

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