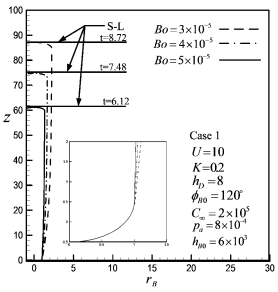
Pore shape affected by gravity

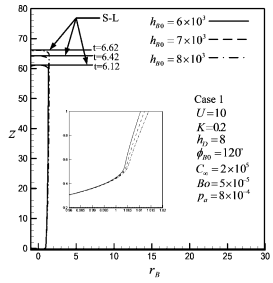
Peng-Sheng Wei, National Sun Yat-Sen University,
Kaohsiung, Taiwan

Abstract (300 word limit)

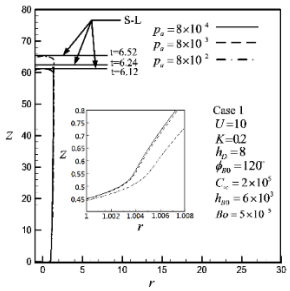
The pore shape in solid as a result of entrapment of a bubble by a solidification front is predicted in this work. Pore formation in solid influence microstructure of materials, and contemporary issues of biotechnologies, etc. It has been known that scaffolds were engineered to be bioactive or bioresorbable to enhance tissue growth. Scaffolds are also designed to induce bone formation and vascularization. These scaffolds are often porous, biodegradable materials that harbor different growth factors, drugs, genes or stem cells. In this work, extending previous models by accounting for mass and momentum transport across a coupled shape of the cap, and focusing on Case 1 which indicates that solute transport is from the pore into surrounding liquid in the early stage, it shows that controlling gravity is an interesting and important factor in manufacturing porous materials. An increase in gravity can increase Bond number, hydrostatic head, and ambient pressure. In contrast to hydrostatic head and ambient pressure, an increase in Bond number decrease pore size and time for bubble entrapment, as shown in figures 1(a)-(c), respectively. The predicted pore shape agrees with experimental data.



(a)



(b)



(c)

Figure 1 The effects of gravity on pore shape via (a) Bond number, (b) hydrostatic head and (c) ambient pressure.

Recent Publications (minimum 5)

1. Wei PS, Chao TC (2016) The effects of drilling parameters on pore size in keyhole mode welding. ASME Journal of Manufacturing Science and Engineering 138: 021008.
2. Wei PS, Chang CC(2016) Existence of universal phase diagrams for describing general pore shape resulting from an entrapped bubble during solidification. ASME Journal of Heat Transfer 138: 104503.
3. Wei PS, Hsiao SY(2016) Effects of mass transfer coefficient on pore shape in solid. International Journal of Heat and Mass Transfer 103: 931-939.
4. Wei PS, Hsiao SY (2016) Effects of solute concentration in liquid on pore shape in solid. International Journal of Heat and Mass Transfer 103: 920-930
5. Hsiao SY, Wei PS (2016) Case study of terrestrial or ambient pressure effects on pore shape in solid. AIAA Journal of Thermophysics and Heat Transfer, (in press)



Biography

Dr. Peng-Sheng Wei received Ph.D. in 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. Dr. Wei 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. Investigations also include studies of their thermal and fluid flow processes, and formations of the defects such as humping, rippling, spiking and porosity. Dr. Wei 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 also received the Outstanding Research Achievement Awards from both the National Science Council (2004), and NSYSU (1991, 2001, 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, during 2015-2017.

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Notes/Comment