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Terrestrial or ambient pressure effects on pore shape in solid

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The shape of a pore resulting from a bubble entrapped by a solidification front for different ambient or terrestrial pressures is predicted. Ambient pressure affects pressure and solute concentration in the pore, and the pore shape in solid. Pore formation influence microstructure of materials and contemporary issues of aerospace, engineering, biology, climate change, etc. This model accounts for realistic shape of the bubble cap subject to balance of pressures and physiochemical equilibrium, and different directions and magnitudes of solute transport. Cases 1 and 2 are, respectively, referred to solute transport from the pore across cap into surrounding liquid and surrounding liquid across the cap into pore in the early stage. Case 2 can be subdivided into Cases 2a and 2b. In contrast to Case 2b, Case 2a exhibits a stronger effect of solute transport across the cap on solute gas pressure in the pore than pore volume expansion in the late stage. The results show that an increase in ambient pressure decreases pore radius and time for bubble entrapment in Case 1. The bubble cannot be entrapped in solid in Case 2, as a result of significant variation of solute gas pressure in the pore in the late stage. The predicted pore shape agrees with experimental data. Relevant prediction and control of the pore shape in solid are obtained.

Biography

Wei Peng-Sheng received his PhD 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, Taiwan, since 1989. He has contributed to application of heat transfer in manufacturing and materials processing, and atmospheric phenomena. He has published more than 90 SCI journal papers, given keynote or invited speeches in international conferences more than 120 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 Invited Distinguished Professor in the Beijing University of Technology, China, during 2015-2017.

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