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Mass transfer controlling of pore shapes in solid

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The shape of a pore, results from a bubble entrapped by a solidification front, is systematically predicted in this work. Pore formation and its shape in solid influence not only microstructure of materials, but also contemporary issues of various biological and medical sciences and engineering, etc. Finding factors affecting porosity in solid or requirements for fabrication of a porous material is therefore critical. This study accounts for realistic mass and momentum transport across a self-consistently determined shape of the bubble cap beyond the solidification front. Contact angle of the bubble cap is the major factor affecting the pore shape in solid. Different mechanisms due to different directions and magnitudes of solute transport across the bubble cap are specially treated. The results show the effects of mass transfer parameters, such as alloy concentration, mass transfer coefficient and supersaturation ratio on the pore shapes and related transport processes in solid. The predicted growth and entrapment of a tiny bubble as a pore in solid are found to agree with experimental data. A realistic prediction, understanding and controlling of the pore shape in solid and fabrication of a porous material has therefore been obtained.

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 80 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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