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A New Approach to Ultrasonic Degassing to Improve the Mechanical Properties of Aluminum Alloys

H. Puga, J. Barbosa, J. C. Teixeira, M. Prokic



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Abstract

Ultrasonic degassing of liquid metals has been studied over the last years, but it has been limited to laboratorial scale experiments of low volumes of melt. In this work, the combined effect of acoustic cavitation with metal agitation induced by the mechanical vibration of the ultrasonic radiator itself was studied, using a specially designed low frequency mechanical vibrator coupled to the ultrasonic degassing unit. Liquid motion in water was characterized by high speed digital Photron—FastCam APX RS video camera and Laser Doppler Anemometry to select the most favorable US and mechanical vibrator frequencies to induce suitable water stirring. Selected parameters were used to degas 10 L of AISi9Cu3(Fe) alloy. A suitable piezoelectric sensor was used to measure sound pressure at different distances from the sonotrode to identify the zone of higher acoustic activity. Results have shown that melt stirring significantly improves US degassing efficiency (since it is possible to achieve almost the aluminum

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alloy theoretical density after 3 min processing time) which contributed to increase the tensile properties of the alloy.









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